UNIVERSIDADE DE LISBOA
FACULDADE DE CIÊNCIAS
DEPARTAMENTO DE INFORMÁTICA

Supporting homeless people with IVR systems

Luís Augusto Pipa Carvalho

Mestrado em Engenharia Informática
Engenharia de Software

Dissertação orientada por:
Prof. Doutor Tiago João Viera Guerreiro

2018

Acknowledgments

I would first like to thank Professor Tiago Guerreiro, who was always available whenever I ran into trouble or had a question about my research and writing, steering me in the right the direction.

I would also like to thank to all participants in the studies performed in the context. of this master's thesis, without them this work was not possible.

Finally, I must express my very profound gratitude to my parents and to my friends for providing me with unfailing support and continuous encouragement throughout my years of study and through the process of researching and writing this thesis. This accomplishment would not have been possible without them.

To everyone who got through difficult times

Resumo

A quantidade de pessoas em situação de sem-abrigo está a aumentar em todo o mundo, principalmente devido aos efeitos da crise económica de 2008, que elevou os preços das habitações, o custo de vida e o desemprego. E também devido à atual crise migratória que a Europa enfrenta. As implicações sociais de ambos os eventos e a atual incapacidade dos serviços de apoio e de emergência para ajudar a grande quantidade de pessoas recém-desabrigadas levaram a uma mudança no perfil típico de uma pessoa em situação de sem-abrigo. Hoje, a maioria das pessoas em situação de sem-abrigo são jovem adultos, crianças e famílias. Embora este perfil seja visto na Europa e nos Estados Unidos em Portugal, o perfil típico de um sem-abrigo é distinto. Um sem-abrigo caracteriza-se por ser português, masculino, em idade ativa, solteiro ou divorciado, com dependências, problemas mentais e desempregado. Hoje em dia, o acesso à informação e à comunicação está a tornar-se cada vez mais fácil devido ao aparecimento de novas tecnologias com preços mais razoáveis. A população dos sem-abrigo não é exceção e usa dispositivos digitais na sua vida quotidiana. Seja usando os seus próprios dispositivos ou recorrendo a tecnologias fornecidas por serviços públicos, como bibliotecas e abrigos sociais. Embora o acesso a dispositivos digitais possa ser fácil, o acesso às informações necessárias para a sua sobrevivência pode ser uma tarefa desafiadora, uma vez que a maior parte das informações é obtida cara-a-cara com outras pessoas em situação de sem-abrigo ou conversando com voluntários.

Algumas tecnologias foram desenvolvidas para a população dos sem-abrigo, mas todos os sistemas encontrados são especializados em tentar satisfazer apenas uma necessidade de informação, como pontos de distribuição de alimentos. O que embora seja útil, para um sem-abrigo que queira algumas das suas necessidades de informação satisfeitas precisaria instalar e saber como navegar uma grande quantidade de aplicações distintas, colocando uma possível sobrecarga sobre o utilizador e tornando a obtenção de informação pouco atrativa.

Em relação aos sistemas de IVR existentes, não foi encontrado nenhum sistema com os sem-abrigo como sua população alvo, mas a maioria das populações onde o IVR foi aplicado partilha qualidades semelhantes com a população dos sem-abrigo. Em todos os estudos apresentados envolvendo IVR, o público-alvo vivia num ambiente com recursos

limitados e com acesso a internet e a informações muito reduzido ou inexiste, eram comunidades descentralizadas, com dificuldades de acesso a determinados serviços como assistência médica e possuiam níveis elevados de analfabetismo. Estas semelhanças tornam o IVR uma boa tecnologia para ajudar a fornecer informações as pessoas que vivem nas ruas.

Este projeto visa melhorar a obtenção, propagação de informação e comunicação entre os indivíduos em situação de sem-abrigo, proporcionando-lhes um sistema interativo de resposta por voz (IVR), facilmente acessível através de um simples telefonema. Essa plataforma permite que as pessoas em situação de sem-abrigo obtenham informações sobre pontos de interesse, contactem voluntários e técnicos de forma fácil e remota, criem e recebam lembretes dos seus compromissos, obtenham informações sobre as rotas de distribuição de comida, façam pedidos à associação e que partilhem informações através de um fórum áudio.

Para obter os requisitos do sistema, recolhemos dados referentes à relação entre indivíduos em situação de sem-abrigo, tecnologia e informação. O nosso objetivo era saber quais as informações a que acedem e com quem comunicam atualmente os sem-abrigo, que tipo de tecnologias eles usam e quais são as suas necessidades atuais de informação e comunicação, bem como podem ser suportadas por tecnologia. Com esse objetivo realizamos três atividades: como primeiro contacto com a realidade dos sem-abrigo, integramos as voltas noturnas de distribuição de comida e suporte de sem-abrigo realizadas por voluntários. Nesta atividade optámos por uma abordagem não intrusiva, onde apenas observamos as ações dos voluntários e as suas interações com os sem-abrigo.

Na segunda atividade nesta fase realizamos entrevistas semiestruturadas com voluntários. Todas as entrevistas foram realizadas cara-a-cara antes dos voluntários começarem as suas voltas noturnas. Nós privilegiamos entrevistas com grupos de voluntários que trabalhavam juntos, em vez de entrevistas individuais, porque queríamos uma maior diversidade de respostas num curto espaço de tempo e compreender a dinâmica entre voluntários dentro dos seus grupos de trabalho. A questões colocadas focaram-se sobre o uso atual de tecnologia e as necessidades informação e da comunicação de pessoas na situação de sem-abrigo e voluntários. A última atividade consistiu num grupo de foco com pessoas que começaram o processo de abandono da situação de sem-abrigo. Começamos por questionar os participantes em relação ao papel da tecnologia nas suas vidas e em que atividades a usam. De seguida realizamos uma atividade de escrita de cartões, onde pedimos aos participantes que escrevessem em cartões as suas necessidades, atividades, limitações e desejos em relação à tecnologia, informação e comunicação. No final do grupo de foco, apresentamos as possíveis funcionalidades de um sistema futuro, numa tentativa de obter feedback em relação à sua utilidade e de descobrir novas possíveis funcionalidades. Após o estudo, tivemos dados suficientes para iniciar o desenvolvimento de um protótipo de uma plataforma orientada a pessoas em situação de sem-abrigo e suas necessidades de

comunicação e informação. A plataforma foi desenvolvida usando a Generic Telephony (GenTel), uma aplicação Python que inclui todas as dependências necessárias para executar uma plataforma de telefonia, incluindo a interação com o servidor de comunicação em tempo real FreeSWITCH, e a síntese de texto para voz através da API Amazon Polly. Em relação a APIs externas, a plataforma usa a API do Google Places, GeoCoding e Distance Matrix Web para obter informações sobre pontos de interesse, endereços e distâncias entre locais. A Google Cloud Speech API é usada para reconhecimento de fala.

O protótipo desenvolvido foi depois apresentado aos técnicos e voluntários da associação, assim como aos sem-abrigo em processo de reintegração na sociedade. O nosso objetivo foi mostrar o protótipo desenvolvido e obter feedback quanto à sua funcionalidade, usabilidade e satisfação das necessidades dos diferentes stakeholders. Também continuamos a nossa procura por novas necessidades que nos possam ter escapado em estudos anteriores. Numa visão geral, a plataforma foi aceite pela maioria dos participantes como uma ferramenta potencialmente útil para ajudar pessoas em situação de sem-abrigo na sua vida diária e dando às instituições mais ferramentas para apoiar as pessoas em situação de sem-abrigo. Cada stakeholder parece se concentrar e avaliar a plataforma com uma perspetiva distinta. Os técnicos concentram-se no seu trabalho de ajudar as pessoas a abandonar a situação de sem-abrigo, querendo que todas a funcionalidades da plataforma estejam conectadas com a instituição e visualizaram a plataforma como um veículo para tornar a instituição e as pessoas em situação de sem-abrigo mais próximas. Por outro lado, temos as pessoas em situação de sem-abrigo que querem a plataforma a suportar todas as suas necessidades de informação, com o objetivo de melhorar a suas condições de vida.

Os voluntários parecem ser o grupo mais dividido em relação à utilidade plataforma. Alguns voluntários partilham das mesmas ideias que os técnicos em relação à plataforma e aos seus objetivos, mas a outra metade pensa que o objetivo da plataforma deveria ser apoiar diretamente os voluntários e ajudá-los a coordenar as suas voltas de apoio aos sem-abrigo, sugerindo uma reformulação completa da plataforma.

Palavras-chave: IVR, Sem-abrigo, HCI, Melhoria do Acesso à Informação, Tecnologias Digitais

Abstract

The homelessness in the world is in increasing, mainly due to the effects of the 2008 economic crisis which increased house prices, the cost of living and unemployment. And due to the current migration crisis, Europe faces. The social implications of both events and the current incapability of the support and the emergency services aiding a large amount of newly homeless people lead to a change of the typical profile of the homeless population, now most homeless people are now young adults, children, and families.

Although this profile seems through Europe and the United States, in Portugal the typical profile of a homeless person is distinct. A homeless person is characterized be being Portuguese, male, in a working-age spectrum, single or divorced, with addictions, mental problems and unemployed.

Current technologies and always-available connectivity enable just-in-time access to information and services. Homeless people can be great beneficiaries of such prompt access to information if it is easily attainable. We performed a set of formative studies with volunteers from a homeless helping association and with individuals who started the process of abandoning homelessness at a shelter to understand current technology usage, and access to information and services, by among the homeless population. We found that access to devices is pervasive in their everyday life. Either by using their own devices or by recurring to technologies provided by public services, like libraries and shelters. Although access to digital devices can be easy, access to needed information can be a challenging task, since most information is either obtained mouth-to-mouth among the homeless community or by talking with volunteers in person.

We designed low-demand information access and communication platform, as an interactive voice response (IVR) system, featuring location services, information storage, asynchronous communication, information boards, among others. To inspect its perceived usefulness and elicit novel usages, we exposed the platform to several stakeholders (homeless people, volunteers, technicians), in a series of workshops. The developed platform helped homeless people find information for their survival in streets, while also allowing associations to better support those who seek help.

Keywords: IVR, Homelessness, HCI, Improving Information Access, Digital Technologies

Contents

List of Figures

Chapter 1

Introduction

The homelessness in the world is in increasing, mainly because of the 2008 economic crisis which increased house prices, the cost of living and unemployment, and due to the current migration crisis Europe faces. The social implications of both events and the current incapability of the support and the emergency services in aiding the large amount of newly homeless people lead to a change of the typical profile of the homeless population. Currently most homeless people are now young adults, children and families [6][5].

Although this profile is seen through Europe and the United States, in Portugal the typical profile of a homeless person is distinct. A homeless person is characterized by being Portuguese, male, in the working age spectrum, single or divorced, with addictions, mental problems and unemployed[1].

Nowadays, accessing information and communicating is becoming easier due to novel, better and more reasonably priced technologies. The homeless population is no exception and uses digital devices in their everyday life [3]. This happens by either using their own devices or by recurring to technologies provided by public services, like libraries and shelters [10][17]. Although access to digital devices can be easy, access to needed information can be a challenging task, since most information is either obtained mouth-to-mouth among the homeless community or by talking with volunteers in person [9].

This difficulty in obtaining information is especially visible in the first weeks of homelessness, when the person does not know anyone living in the streets or services essential to his or her survival. This reveals other problem, which is information persistence among homeless people [12]. Due to the, sometimes temporary, nature of homelessness, essential information is always getting lost, since there is no way of propagating street knowledge from individuals who abandon homelessness to the more recent homeless people [9]. On the other hand, previous studies have also showed that the homeless community suffers from information overload, due to the large amount of information service providers share about their programs. This means that for some individuals this information is not essential to their survival and therefore considered useless [12].

1.1 Research goals

The main objective of this thesis is to design and develop technologies that facilitate the obtainment of information and communication among homeless people and their surrounding environment. The sub-objectives are:

- Understand the current relationship between technology and homeless people.
- Understand their unfulfilled communication and information needs.
- Design and evaluate a platform aimed at fulfilling those needs.

1.2 Approach

First, I started by researching for scientific papers regarding the relationship between homeless people and technology, in hope of finding their current activities and needs. After, I started looking for previous projects and systems developed aimed at homeless people. In the last part of my research, I focused on the previously developed Interactive Voice Response systems, analyzing their use and the target population.

Since the homeless community is difficult to approach due to its nature, we worked with an organization aimed at helping people abandoning homelessness, to obtain data regarding the homeless community in Lisbon. We started by observing the volunteers during their food distribution routes as the first contact with this reality. In these routes, they would distribute food as a pretext to establish contact with the homeless people.

With the information gathered from the observations, we created and performed group interviews with the volunteers from the organization and a focus group with homeless people, who started the process of leaving homelessness. The objective of the interviews was collecting data regarding the homeless people use of technologies, their limitations, and needs.

This information was then used to design an IVR platform aimed at both homeless people and institutions, in hopes of enhancing the quality of life of those living in the streets, but also facilitate information flow between homeless people and institutions.

After the development, we returned to the stakeholders and showed the prototype to obtain feedback and preliminary validation regarding the implemented features, their usefulness and directions for future research.

1.3 Contributions

In this master's thesis, we contribute with:

- **A Characterization of the relationship between homeless people and technology**, by knowing their current ways of technology use and information obtainment.

But also, by knowing their information and communications needs, and how technology could fulfill said needs.

- **An Interactive Voice Response System** that allows homeless people to obtain information, regarded as crucial for their survival in streets, and at the same time allowing better communication between the homeless people and the organization. It addresses promises to facilitate the abandonment of homelessness and the information regarding the process.

- **M.A.P.A web platform**, developed for an organization as a way to support people who left homelessness and are integrated into mainstream society but want to keep in contact with the organization. The platform allows the user to access job opportunities, workshops, and habitations for rent. This contribution is only addressed in Appendix E as it was a parallel contribution, although derived from the preliminary studies.

Chapter 2

Background

According to the United Nations Office of Human Rights[1], the definition of homelessness can be divided into two categories. The first, primary homelessness, includes people living in the streets and without shelter or living quarter. And the second, secondary homeless, includes people with no place of usual residence who move frequently between diverse types of accommodation, people resident in long-term transitional shelters or similar arrangements and people living in private dwelling but reporting 'no usual address' on their census form.

In previous research by Woelfer [16], it is discussed the two ways homelessness can be interpreted. Either as a legitimate way of living or a problem in need of fixing. The study assumes that this distinction is necessary because, depending on the interpretation, distinct technological solutions with distinct objectives should be created.

For the first case, the solutions should aim at improving the homeless way of life, by facilitating access to services (like food, health-care, safety...), enhance communication within the community and allowing the homeless to expand their networks. In the second case, it should aim at helping people abandon homelessness, by giving the homeless people information and skills with that goal, by making possible their participation in mainstream society and enabling communication between the homeless community and institutions.

2.1 Homelessness in Portugal

A study carried out by 'Santa Casa da Misericórdia'[2] in 2013 about the existing homeless population in central Lisbon counted in total 853 individuals classified as homeless. From this amount, 509 lived and slept in the streets and 343 were housed in temporary shelters. Most individuals were male (87%), Portuguese (59%) and didn't have any source of income (72%). In terms of time being homeless, the majority was less than a

[1] http://www.ohchr.org/Documents/Issues/Housing/homelessness.pdf (last accessed on 05/10/17)

year (32%) or between 6 and 20 years (32%) living in the street. Suggesting that for every 10.000 residents, 18 individuals were homeless, and 11 individuals slept in the street.

'Santa Casa' performed another counting of homeless people in the streets of Lisbon in 2005. This time, the total number of individuals classified as homeless was 818, with 431 living in the streets and without home and 387 living in shelters. Although the numbers do not show a great distinction from the 2 years before, is possible to observe that not only the number of homeless people diminished but also the number of people living in the streets diminished and the number of people living in shelters increased.

In these studies, the typical profile of a homeless person is Portuguese male, in working age (between 30 and 49), single or divorced, with addictions, mental problems and unemployed.

A social-demographic study conducted in Lisbon by the local government aimed to interview the homeless population and obtain their social and health characterization and general profile. The study revealed that from 630 individuals interviewed, a typical homeless people is male (88,6%), between 35 and 64 years old (68,1%), single(48,3%) or divorced (14,3%), Portuguese (56,5%), either finished secondary school (20.0%) or primary school (19.4%) and with no income (27,9%) or precarious jobs (27,8%) or receiving Social Integration Income(13,5%). In regard to health problems, the most frequent are muscular-skeletal disorders (30%), followed by respiratory problems (20%), cardiovascular problems (16%) and psychological problems (15.5%)[1].

Also in 2013, AMI (Assitência Médica Internacional) a health and support related organization stated that supported 1,679 homeless people, being mostly men (76%) and Portuguese (79%), where 50% had between 40 and 59 years old and 20% between 30 and 39 years.

On Porto, the NPISA (Núcleo de Planeamento e Intervenção Sem Abrigo), reported 1300 people living in shelters and about 300 without a house, living in the streets [4].

2.2 Causes, Needs, Practices and Limitations

The European Commission for Employment, Social Affairs & Inclusion points out that the current typical causes of homelessness are the following:

- unemployment and poverty;
- migration;
- aging;
- health problems;
- relationship breakdowns;

- lack of affordable housing for rent and for sale;
- inadequate support for people leaving care facilities, hospitals, prisons or other public institutions;

The EU commission also points out that due to the current crisis the homelessness levels have risen over Europe and that the typical profile of the homeless population is changing. Now including more young people and children, migrants, disadvantaged minorities, women and families.

A study by Thompson et al. in 2005 [14] aimed at discovering what were the needs of the homeless and how to fulfill them. They found that food is a much-needed resource among the community since services providing food were the most utilized. The importance of a place to stay overnight is also shown because most participants slept in a shelter, only if properly maintained, or in a tent. Another important need was hygiene and clothing since the participants like to appear ”not homeless”, which increased their opportunity of getting a job. This leads to the next need, a consistent source of income. Most individuals to have some sort of income end up doing odd jobs, like picking up cans [12], to ensure their survival because most employers of full-time jobs have requirements that are nearly impossible to overcome by the homeless, like maintaining important documents over an extended period, having a fixed house address or effective way of communicating.

Case Managers were also found to be needed by the homeless community because they negotiated with the social service systems and advocate on their behalf. They help to find a job, housing, getting documentation, locating supplies and helping the homeless develop goals and strategies to successfully accomplish those goals and stay motivated. The study also revealed the limitations people suffer due to the nature of homelessness. One example is, the existing cumbersome process of accessing some services and thus discouraging the service use. A disconcerting example was the case of homeless individuals that had to choose between trying to find a job and eating because many services were only open or serving food during regular business hours. Must of the time services are not necessarily found in a confined area of the city, so to access them individuals must spend a great deal of time traveling from a location to another and spending income.

2.3 Technology among homeless people

In their research, Roberson and Nardi [12], classified the way the homeless community used technology into two categories, those who used it for survival, like finding shelter and food, and those who use it for social inclusion to connect with other communities and diminish their isolation. But, as Woelfer and Henry [16] found, the use of technology is heavily conditioned by people’s circumstances of homelessness, meaning that survival can sometimes force the homeless to pawn their digital devices to fulfill other immediate needs, like food.

The opposite was also found, in Woelfe's study [17], where the homeless gave their digital devices to others has an act of goodwill, which apparently seems to go against their self-interest, but this was a way of creating social capital, and thus, increasing their connections and consequently their survival. At the same time, in a study by Le Dantec [8], when members of the community were asked if they would sell their cell phones, they all responded no. This way showing the importance of staying connected with their family and friends, and that the cell phone is the preferred way of staying connected. But still, the homeless community finds barriers in their usage of mobile devices, like having to pay a message or data plan to keep using it, difficulties accessing the infrastructure to recharge the devices and the risk of having them stolen[10].

2.4 Adversity to Technology

Not all stakeholders in the homelessness sphere think technology could be useful to develop solutions to this problem. One point Le Dantec [8] makes is that the homeless prefer interaction to be personal instead of through technology because it creates a sense of emergency and also helps them feel included. Having that in mind is suggested that a technological solution should focus on enhancing personal contact time and not substitute it. Also, most homeless people think that most digital devices aren't useful to either increase their survival in the streets or make more connections, being the exception, mobile phones, and music playing devices.

Most homeless people have very little to no experience with computers, because of the difficulty in keeping digital devices safe while living in street, existing always a high risk of theft and due to the time and location restrictions when using public computers from service providers like libraries and shelters. These reasons make the homeless community feel disinterest about the use of computers. From service agencies, the homeless use of technologies is also found with adversity, some agencies consider the use of social media applications as a way of procrastination and addiction because it takes time away from the homeless people to develop in-person relations with case managers and because they perceive social media as a way to reinforce a "street life" identity, making it more difficult to abandon homelessness. [16]

2.5 Developed Technologies

Mohan and Sarmo [10] design and develop a mobile system, called Elevate, aimed at enhancing the access to information regarding the serving of hot meals. They started by designing and testing a smartphone application that allowed users to find the nearest places serving food via GPS and sign up for daily notifications associated with specific food sources. Although the testing revealed that the application addressed the homeless

needs, it also revealed the previously referred community limitations.

The access to smartphones able to run the application among the homeless was low and that the number of homeless people with data plans was even lower or nonexistent. So, they redesign the system to be SMS text-message based so that it would work on any mobile phone. The system worked by allowing the user to send the zip code of their current location and receive a list containing: name, address, days of the week, times food is served and requirements to receive the free meal. The system allowed the user to also receive weekly notifications to the zip codes entered and update the database by sending additional information they discover. The system was also aimed at the social workers by allowing them to update the database and at the same time have access to crowd-sourced information that allowed them to improve their work.

The use of technology has helped shelters and organizations interacting and rescuing homeless from the streets, with systems that allow and make easier the communication between the homeless and the staff, like the CRM (Community Resource Messenger). This system allows permanent communication between the homeless and the shelter staff, without the physical presence of staff. And at the same time, allows information sharing between all staff, about each person in care. [9]

2.6 Developed Interactive Voice Response Systems

2.6.1 Synchronous Systems

In his research, Kazakos et al. [7] designed and developed a synchronous IVR platform called Sebat Ki Vaani, that enables the hosting of radio chat shows through an Android application and enables listeners to participant in the show through a simple call with their mobile phone without any cost. This system was tested in North India with two local community health workers, that hosted a total of six radio shows, discussing Type 2 diabetes and maternal health. The platform aimed at filling the existing research gap in terms of the synchronous low-cost community-led IVR system in resource-limited settings. Due to the elevated levels of illiteracy in this community text-based communication wasn't a good option, so the researchers opted by using a non-text communication approach, an IVR system. Before starting the development of the platform, the researchers conducted a field study with the target population where they learned two aspects: first, that individuals valued connecting with others who live in the same conditions have them, by sharing their experiences and giving/receiving tips about a better self-management. Second, individuals adverted that the system should be free and provide support to illiterate users, ensuring to some degree the same opportunity of opinion sharing and information access.

Researchers proceeded to create and test medium-fidelity prototypes using a commercial VoIP app that allowed groups chats using mobiles phones. The result was a chaotic user experience because many individuals tried to talk at once and due to technical prob-

lems since the app required stable internet access. The developed platform was based in a client-server architecture with two different clients: the Radiohosts and the Listeners. The Radiohost client was an Android-based application and required an Internet connection. It allowed the registration of individuals that are interested in listening to the show, create and distribute a trailer of the show to registered numbers, broadcasting and stopping a radio show, monitoring the radio show duration, viewing the number of listeners and displaying the list of listeners who want to interact with the show. The Listeners through their mobile phones could show interest in listening to the show, listen to the show, show an interest in contributing to the show by dialing 1 and talk with the host. The back-end was hosted on a cloud-based service and accepted requests from the Radiohost client. The server managed all the telephony functions through an open-source VoIP server technology called FreeSWITCH, accepting audio from the Radiohost client and sending it to all Listeners that are using a standard phone connection. For Listeners the platform was free, but running a show had a cost of 5 INR (Indian rupee) a minute for the host.

During piloting, it was found that the Radiohost client made unnecessary pull requests to the IVR server and that the telephony networks were less stable than what was expected, resulting in connectivity problems with some Listeners. During the deployment of the platform, the hosts not only had to plan the shows and register listeners but also encourage listeners to participate, help the participant make their point, address the questions and topics of conversations the participant raised. Meanwhile, for the listeners, the show provided them with comfort because their questions and concerns were answered. But, the act of listening sometimes resulted in a frustrating, boring or confusing experience, either because of the poor telephony networks or because the long time they would need to wait to participate in the show since there was no way for the listeners to know how long they had to wait.

In his research Yadav et al. [18] designed and developed a synchronous IVR platform called Sangoshthi. This platform aimed at being low-cost and allowing training and learning in a low-Internet access environment, by combining Internet and IVR technology to host real-time training sessions through basic cellphones. This platform was tested with Accredited Social Health Activists (ASHAs), these activists exist in rural and low-literacy areas has a way of improving the health of newborns by visiting their homes. To become an ASHA, each woman receives an initial modular training, but once finished her training continues, to ensure continuous improvement of skills. However, in practice, the implementation and execution of this training and re-skilling programs face many challenges, like the shortage of skilled trainers, insufficient funds, inadequate training space and lack of training aids.

To better understand the needs, the researchers collaborated with a non-government organization that works in the field of maternal and child health. Because of this collaboration, two key components of training were found: the creation of standard content

and its delivery to the ASHAs timely and uniformly. After conducting a focus group with some ASHAs they found that 'peer ASHAs', either face-to-face or through phone calls, was the main point of contact for discussion and knowledge propagation among the ASHAs.

The solution presented by the researchers was remote learning. This approach was found to be cost-effective, scalable and appropriate for decentralized communities, like the ASHAs. To materialize this solution, they proposed a platform using the Internet connection and IVR technology that allows trainers and learners in separate places to exchange information in a class like an environment. This environment is achieved by having a conference call that is comprised by a host, that facilitates the communication, an expert and learners that listen to and intervene in the call. The system developed in this research is built upon the one developed by Kazakos et al. [7] in his research. It is a client-server architecture where the client is an Android application built using the existing beta-versing of Citizen Radio, allowing the host to create and manage shows. The server is built upon the open source telephone platform FreeSWITCH that manages all telephony related activities.

To test the Sangoshthi usefulness and user-experience, the researchers created two groups of ASHA, a treatment group that would learn through the radio show and a control group. In terms of the host user experience with the app, problems arose due to the slow internet connection, which increased the app's processing times and resulting in a frustrated host. The show had two segments, an initial that delivered information about the topic, and the final segment where listeners could interact with the expert. To measure the knowledge level of the members of the two groups a questionnaire was made before and after training. The results showed an improved knowledge in both groups. The increasing knowledge showed by the control group is attributed to the sharing of information among ASHAs outside the training lessons.

Talhouk et al. [13] studied the influence of radio shows on Syrian refugee's health and community. The motivation behind this research was the difficulties refugees have in communicating with health care providers, the non-existing transportation to clinics and the fact that most refugee's families have at least one smartphone. The study was conducted in an Informal Tent Settlement in rural Lebanon for two months. The following activities were realized:

- Discussion regarding the way people would commission a community radio show.
- Exploring how a community show would run, researchers conducted radio shows using paper mockups, a function limited Citizen Radio as host and one listener phone, where each woman could ask her questions.
- Interviews and focus groups after each show with the users, to capture their experience in the show.

- Questionnaires before and after the show to assess knowledge improvement within the community.

During these activities, some social considerations arose. First, the community considered the role of host a prestigious position and with impact in the community. Second, the selection of a host should be done carefully since it influences the community dynamics. Third, the topic and time of the show should be discussed and decided by the community. This revealed to be a critical point since some women were pressured to leave the shows earlier.

During the show runs the researchers observed a high degree of self-organization among women. The women self-organized in a way to ensure that the same question would not be asked twice and that the queuing order of interaction was respected. In terms of privacy, initially the use of one phone and the sharing of health conditions and doubts was not a problem, but later when unwanted community members started attending the shows it became a problem since some women refuse to share their questions. The research shows that the use of the communication radio shows to obtain health information was more benefit than face to face consultations because the remote participation allowed the listeners to expose their question in a more comfortable way. Also made the listeners feel more accompanied by the health providers since they had time to explain and existed a host to moderate the talk between listener and health provider in case of misunderstanding. The health providers also point out that the remote nature of communication was a benefit to them since they did not need to leave their current locations to consult various people. And point out that the refugees were normally not responsive in face-to-face consultation but through the radio shows they engaged more easily, providing this way, a better understating of the refugee community. The functionality of recording radio shows was found to be useful to both listeners and health providers. For listeners was useful because it allowed the propagation of information to the non-listeners member of the community and for the providers was a benefit because the recording could be used in the training of other providers. The researchers suggest that community-led commissioning of radios shows should be divided into three stages:

- Initiation – In this stage hosts, topics, health providers and audience are selected.

- Mediation – Where the hosts and health providers discuss and refine the selected topics and the preferable times and dates of shows.

- Validation – In this stage, the Ministry of Public Health will evaluate randomly selected recording of radios shows to guaranty information correctness and the quality of health providers.

2.6.2 Asynchronous Systems

In the field of asynchronous IVR systems, Patel et al. [11] designed, deployed and evaluated an asynchronous voice message forum called Avaaj Otalo. This research was made in India and aimed at providing farmers with an interactive on-demand way to access and share agricultural knowledge, that would complement and be supervised by an already existing agricultural radio program, called Sajjata No Sang Lave Kheti ma Rang, produced by the Development Support Center, an NGO. The developed system would facilitate de communication with the radio listeners, allow the incorporation of listener feedback into the program and allow the agricultural experts to respond effectively to shared questions. To design the system the researchers conducted interviews with farmers, experts, DSC staff and radio producers. Farmers also participated in questionnaires and focus groups. Based on the data gathered, the researchers concluded that a voice-based system accessible through simple mobile phones is the most appropriate technology to use since most farmers had a cell phone and did not use text messages. The system had three features: a Questions and Answer Forum, where users could record and post a 30 seconds question/answer and browse a list of existing questions, ordered by latest. The system did not allow to search specific content and only played to two answers of each question; an Announcements Board, where the DSC posted announcements and news; a Radio Archive, where users could listen to previously broadcasted programs.

The system was implemented as a VoiceSite using IBM Research's Spoken Web platform. Phone calls were routed to a Cisco Gateway through an ISDN connection, supporting up to 30 simultaneous calls. The deployment was conducted for 7 months and with 51 participants. All participants receive a briefing, from DSC, on the system features and how to use them. The researchers collected data through a logging system that recorded the interaction between the system and the call; transcription and coding of questions and answers posted in the system; interviews with the stakeholders.

During deployment, 71% of users called the system at least once, resulting in a total of 6,975 calls. The Q&A forum revealed to be the most used featured of the system and the most liked (65%) by the participants. The system could be interacted with through voice commands and touchtone input, but results showed that touchtone was the most used among participants, with 100% of the interviewed showing preference for the touchtone. This unanimous opinion was attributed to the low accuracy of the speech recognizer, resulting in faulty user experience. Participants also showed interest in the implementation of a message skipping mechanism, since it would increase the browsing user experience. When asked if the forum content should be ordered by time, user or topic, 85% of the participants preferred a topic organization. About 77% of the farmers revealed their satisfaction with the forum, due to the huge value they found in listening to others' questions. Regarding the answer source, 65% of users said they preferred staff only answers and 35% preferred answers from both staff and farmers. The studies also found that some farmers

hesitated in responding to question. Either because they did not want to be held accountable over the effect of their answer on others or because they lack confidence in their own knowledge. Overall, the DSC also had reservations regarding the quality of the answers provided by farmers, since the DSC wanted to ensure that only accurate and high-quality information was shared. With that said, some users expected answers to come from DSC and for farmers to offer their practical experience was a way to complement the DSC information.

In his research Vashistha et al [15] developed and deployed a voice forum, called Sangeet Swara, for cultural content where posts were curated by the users. This forum used an IVR system, allowing the user to record and listen to messages via phone call. In this research, they aimed at evaluating three topics: the engagement of users, the accuracy of community moderation and financial sustainability.

The developed system would present the menu options available and would allow users to select the desired option using key presses (DTMF). The system had the following functionalities: Check the user previous posts and its ranking; Record a post with a limitation of 60 seconds. For each new post, the user would receive a message with the post unique ID. The ID allowed sharing the post and jumping directly to the post when entered in the main menu; Listen to other posts and rate them. First, the system would play the top-ranked post and then play a mixture of low and top-ranked posts. After listening to each post, the user was prompt to rate it, giving a like or a dislike; The ranking system sorted posts by increasing order of quality. The quality of the posts was determined by the user's vote, existing two criteria in the rank order: high scores, a post with mores likes were more likely to be of high quality; high confidence: a post was better if it had more votes. The order of the posts provided to the listeners was obtained through the combination of posts' fraction of positive posts and posts with a small number of votes.

The system was deployed for a total of eleven weeks. During the first 7 weeks, a toll-free number was used, but due to its excessive cost, in the last 4 weeks, the system used a regular number. During deployment, the system receives a total of 25,000 calls from 1,500 people, with 5,000 posts and 140,000 votes cast. About 26% of users were found to be visually impaired, while in terms of location 50% were from small towns and the remainder from larger cities. In terms of the content half were songs and poems and the remain general social media. The users considered the platform to be useful and impact in their lives, allowing them to show their creativity and opinions.

2.7 Discussion

As presented in this chapter, technology use and ownership were found amount the homeless population in previous studies, but their relationship with it and level of importance varies. On the one hand, studies showed that technology is one of the first assets to be

sold if survival is at stake, but in the other hand, a study revealed the opposite, in which the homeless people would never sell their device. This reveals the variation in behavior among the homeless population in different locations and conditions, showing the need of analyzing the current homeless population before starting the development [16] [8].

Many technologies have been designed and developed for the homeless population, but all found systems specialize in trying to satisfy only one information need, like food distribution spots. Which although useful, for the homeless person to have some of his information needs satisfied would need to install and know how to navigate a large number of distinct applications, placing a possible overburden over the homeless person and making information obtainment unattractive [10].

Regarding the existing IVR systems, none was found to be targeted at the homeless people, but most of the populations where IVR was applied share similarities with the homeless population. In all studies presented involving IVR, the population target lived in a resource-limited setting with low or none internet and information access, were decentralized communities, had difficulties accessing certain services like healthcare and had elevated levels of illiteracy. These similarities make the IVR a good technology to help to deliver information to people living in the streets [7][11][15][18].

Chapter 3

Understanding the stakeholders

The previous chapter showed that the most important needs of homeless people are food, a place to sleep and hygiene and that the use of technology in conditioned by the circumstance of homeless, meaning the satisfaction of those 3 important needs. Since the typical profile of a homeless person in Portugal seems to be distinct to the one described on Europe and on the previous research, it is essential that we characterize and understand the homeless population we are facing and their relationship with technology.

For us to be able to characterize the homeless people relationship with technology, the kind of technologies that are used and how, the current information and communication needs and access practices of the homeless, and how can they be supported by technology, we worked with an organization aimed at helping people abandon homelessness.

This partnership allowed us to observe and interview volunteers and homeless people. The volunteers worked in the food distribution routes, contacting directly with homeless people, delivering them food as a pretext to communicate with them and help the homeless people abandoning the streets. The homeless people we interview were integrated at a temporary shelter, the first step for a person to leave homelessness and be reintegrated into mainstream society.

To guaranty a correct, legal and ethical approach to the homeless community, we created and submitted the required documentation to the Ethics Committee for Collection and Data Protection of The Faculty of Sciences (CERPDC)[1], which approved our methodology, allowing us to perform the following studies with the stakeholders. The full documentation can be found in Appendix A.

[1] https://ciencias.ulisboa.pt/pt/protecao-de-dados

3.1 Observation study

3.1.1 Goals

To obtain a first contact with homeless people and their reality, we accompanied volunteers from an organization during their food distribution routes. With this study, our goal was gaining a basic understanding of their way of action and gaining a first impression of the homeless way of life and its problems, with emphasis on discovering more regarding technology and its uses in both volunteers and homeless people.

3.1.2 Participants

In pairs, we were integrated into 3 food distribution routes, each with a distinct volunteer group. Each volunteer group was constituted by 3 to 4 active members, where some members have specific roles like driving and report writing. The number of homeless people intercepted by a volunteer group averaged on 20 people a night.

3.1.3 Methodology

In this study, we opted for a non-intrusive approach. We mainly only observed the volunteers, their actions and their interactions with homeless people. Informal speaking also occurred with volunteers and homeless people when the opportunity arose. Data was only collected after the night rounds through written notes, since taking notes during could disturb the volunteer's work.

3.1.4 Results

Rounds and Homeless people

Every night the routes started around 8 pm and departed from the organization center. Each route had a specific group of volunteers attributed and a determinate set of locations, where the volunteers had to pass for no order. The volunteers' goal was helping people abandoning homelessness and helping them in everything they could, using food as a pretext of approximation to homeless people. To avoid the creation of a strong bond with the homeless people each member of a volunteer group would only participate in the routes every 14 days.

Each route had two types of stops: those where the volunteers expected to be approached by homeless people and those where volunteers would search in a specific location for homeless people or for a specific person. In the first case, homeless people know where to approach the volunteers because the distribution routes had specific meeting locations. Generally, homeless people who approach the volunteers only wanted food and left. Others only wanted to chat with the volunteers, a person even refused to accept the

food even though had not eaten during the day. During these conversations, the volunteers asked questions regarding the state of their lives and regarding their health, their medical examinations and the latest doctor's appointments. Not all people that approach the volunteers lived in streets, since some said to have a home, but lived precariously.

Most of the homeless people approached by the volunteers were in a location where they would stay for the night. These locations include front porches of major buildings, park benches, and camping tents. Since we arrive at some stops late at night, most homeless people would already be asleep or would not want to be disturbed, either way, volunteers left food.

It was also observed and stated by the volunteers the interaction between the population and the homeless people. Most residents help the homeless living in their streets and show empathy toward them but most wish they were not there, complaining about their smell due to lack of personal hygiene. Residents also play an important role in information propagation regarding the homeless people, since they keep track of homeless people locations and their disappearances, relaying this information to the volunteers.

Tension

The tension between various stakeholders was found:

1. Between the people homeless and the shelter organization - Some homeless people reported their attempts in abandoning homelessness through the existing shelter organizations but were unable to conclude the process. Volunteers said that the rules and schedules imposed by the workers at the shelters and the poor relations between shelter-users made them dislike the environment in the shelters and quit the process.

2. Between the homeless people and the volunteers - Not all homeless saw positively the visits of volunteers. Some simple refused help, while others made loud accusations and confronted volunteers. An example we observed, was a group of homeless people inebriated lying down in the street that when approached by the volunteers, accused them of distributing spoiled food.

3. Between the volunteers and the population - During the rounds some individuals, for example, private security guards, obstructed the access to places where homeless people were staying during the night.

Technology

We observed that technology existed among homeless people since some homeless people possessed basic cellphones. Some volunteers had good relations with specific homeless people, they would share their phone number in case any problem arises.

Currently, volunteers use a platform online called "E-Volta" for writing and storing the round reports. In these reports is written whom they encounter, where was the encounter, what they talked about and the state of the person they encounter. Before starting a route, the volunteers have access to previous reports to prepare their route, although many admit sometimes not having time to consult them. Although the platform is online, during the route the report is written on a paper sheet and only later is copied to the online platform. A missing feature in the platform pointed out by the volunteers was the impossibility of adding photos to the report. This would be useful to record visually the homeless people life conditions.

When we explained the objective of our project, the volunteers responded positively. Stating that free technologies for access and sharing of information would be useful since they find the transmission of information between the organization and the homeless community to be currently deficient and delayed. An example given was the clothes request made by homeless people. Since the requests take a long time to be fulfilled by the organization, volunteers end up getting clothes to minimize the delay. Yet they showed some doubt stating that the only way of understating its usability and impact on the stakeholders would be through real-world testing.

Volunteers

All the volunteers we accompanied had at least 4 years on experience in volunteering. Most started because they saw volunteers in action on television or saw many homeless people in their daily life and wished to help. Others started through challenges promoted by their employers and later decided to continue.

According to the volunteers, the main reason for people living in the street is the absence of income due to unemployment. Other reasons stated are the lack of documents in the case of immigrates, addictions, and mental health illnesses. According to them, lack of food and famine among homeless people is nonexistent due to organizations like this one and food kitchens.

3.2 Interview study

3.2.1 Goals

Our goal was obtaining the volunteers' point of view regarding the relationship between homeless people and technology. We aimed to know the current use, limitations and problems of technology for homeless people. While also focusing on the communication and information needs of both homeless and volunteers.

3.2.2 Participants

A total of 17 volunteers were interviewed, 16 participants through 5 group interviews and 1 through an individual interview. From the participants, 8 were men and 9 were women. The ages ranged between 22 and 56 years, with and sample average age of 39.41 years, a standard deviation of 10.20 years, and a median of 40 years. On average the participants spent 3.45 years volunteering with a standard deviation of 2.42 years, with the least time volunteering being 1 month and the most time being 10 years.

3.2.3 Methodology

All interviews were held face-to-face at a shelter in Lisbon before the volunteers stated their distribution routes. We privileged interviews with groups of volunteers that worked together, instead of individual interviews, because we wanted the greatest diversity of answers in a restricted time schedule and to understand the dynamic between volunteers within their groups. The interview followed semi-instructed planning, with questions focused on the current use of technology, the information and communications needs of homeless people and volunteers. The script for this study can be found in Appendix B on the section Volunteers Interview.

3.2.4 Results

Homeless people do not use technology

Some volunteer groups answered that the homeless population does not use any type of technology or that only a small proportion of homeless uses cellphones, about 2 in 10 individuals. The reasons presented for the (almost) nonexistent use of technology were the homeless life conditions, which do not allow the possession of many material goods since they do not have a place to store them safely, making them an easy target of thefts. Another fact presented was that they do not have money to spend on either obtaining technology or maintaining technology, like paying for data plans, calls, and messages. The volunteers describing this scenery also said that usually do not question the homeless about their life and their material goods, because the volunteers consider it an “invasion of personal space”, hence the opinion that homeless do not use technology.

These volunteer groups found absurd discussing technology among the homeless since they thought we should instead be discussing ways of promoting the interaction between volunteers, the organization and the management of volunteers. Other volunteer groups said that never had seen any homeless use any technology during their routes but assume that own it since during the organization Christmas fest they saw many homeless use cellphones.

Homeless people use technology

In contrast to previous volunteer groups, most groups answered that the homeless community uses technology actively. The most used type of technology by the homeless people is the cellphone, but there are also reports of the smartphone, tablet and radio use but in a much smaller proportion. In terms of internet use, only an even smaller proportion of homeless people uses it through free Wi-Fi access points in cafes and train stations.

The volunteers declared that the technology use and ownership are correlated with the current individual situation and the age of the individual. For the first case, two types of situation: individuals that do not own a home and individuals that are in a precarious living situation. The later ones usually own more technology like smartphones, since their life is more organized than the first ones. For the second case, older individuals do not find interest in cell phones and do not have money to spend on it but, in individuals, under 40-50 years old the use and ownership of cellphones is more prevalent.

In terms of homeless people resorting to the use of technology existing in public places, it was found that the usage is very reduced due to people's preconception homelessness, and thus not allowing them to attend those places. The homeless use technology mainly to communicate with people which they do not see on a regular basis, this may encompass relatives and friends. An example given by the volunteers is the case of a homeless person in Lisbon that once a week calls his family on Madeira.

Other current uses of technology are:

1. Contacting social services;
2. Contacting medical services;
3. Using the internet to access news and meteorology;
4. Using the internet to search;
5. Mainly for leisure activities.

Information Needs

Currently, the main way for homeless people to obtain information is through direct communication with the volunteers and other homeless people. The volunteers claim that information flows relatively well and quickly in the homeless population since their survival and well-being most times depends on it. For the volunteers the homeless information and communication needs are the following:

1. Where to stay during the night;
2. Where to obtain food;

3. Where to obtain clothing/blankets;
4. Where to do the hygiene;
5. Where to obtain medical care, either mobile medical posts like the Doctors of the World organization vans, or fixed ones like health centers;
6. Houses/Rooms available and the process of how to apply for;
7. Available shelters and their occupancy rate;
8. Support/Information for people wanting to leave homelessness and registration in treatments;
9. Existing institutions, including their address, contacts, and services provided (Including state ('Câmara Municipal') and private ('Santa Casa da Misericórdia') institutions);
10. Initiatives and Events
11. Public transportation (schedules, stops, and prices);
12. A platform where the homeless could ask questions anonymously and obtain answers from an instructed individual in the theme of the question. An example provided by the volunteers was the setting where someone wants to abandon its drug addiction and to obtain information on how posts an anonymous question;
13. Schedule of each institution round and their stopping points, since must institutions only do rounds some days of the week;
14. How and where to obtain documentation and treat bureaucracy;
15. Information about activities they like, to improve them and at the same time reintegrating them back in mainstream society;

Volunteers also pointed out that some of this information is already available to homeless people, but they lack the will and pro-activity to access it since their life is so unstructured and lacking priorities mainly due to addiction problems.

Interaction between volunteers and homeless outside volunteering

In this topic, two distinct groups were found: those who interact with the homeless people outside their volunteer time and those who do not. In the first case, there were volunteers who shared their cellphone number with some homeless people, to keep in touch with them and as a support in case something bad happens and would invite them to lunch or talk. In the second case, volunteers saw sharing their cell phone number or asking for

the homeless their number as something offensive, since to them it must exist a certain distance between the volunteers and the homeless people.

Technology suggestions, requisites and restrictions

Volunteers felt that is missing some type of platform through which homeless people could access services and obtain information. They also found useful if the platform could warn the individuals of appointments and activities since it would make the homeless less erratic in terms of scheduling and allow some stability. A crucial requirement of the platform is that should only contain practical and useful information and avoid generic information because the homeless can easily obtain that type of information. Another requisite is that should be user-friendly, and the information should be well divided in logic categories like the example given by a volunteer:

1. Habitation → Shelters...
2. Well-being and Health → Health Centers...

The platform should also have some type of GPS integration, has a way to know the homeless current position and display the closest points of interest. A restriction imposed by a clear majority of volunteers is that the platform cannot replace any type of service or face-to-face contact with the homeless, should only be used as an auxiliary tool. Some volunteers suggested a platform that consisted of a street panel installed in well know and easy access place, that would display information targeted at homeless and the information needed by them. To solve the lack of pro-activity of the homeless population regarding obtaining information, the volunteers admit that would be needed an awareness campaign aimed at homeless people and involving the volunteers' teams.

3.3 Focus Group study

3.3.1 Goals

After obtaining the volunteers' point of view of the relationship between homeless people and technology, we aimed at obtaining input directly from homeless people. Since elicitation of people currently in homelessness was not possible, we conducted a focus group with people that started the process of abandoning homelessness and currently at the organization. The goal was obtaining their relationship with technology, including its uses, needs and limitations, and finding their communication and information needs.

3.3.2 Participants

We conducted a focus group with 11 people, which stated the process of abandoning homelessness, and a social worker. Most participants were between 35-50 years old, with

the minority between 20-35 and 60+. This activity took place at a temporary shelter for people who want to start the process of abandoning homelessness.

3.3.3 Methodology

The focus group was divided into 3 phases:

Conversation about technology - In this phase, we question the participants about the role of technology in their lives and activities in which it is used;

Card Writing - We asked the participants to write in card their needs, activities, limitations, and wishes regarding technology, information, and communication.

Features Presentation - We described the possible features of the future system in an attempt of obtaining feedback regarding its usefully and finding new features.

During this activity, when possible, notes were taken, and audio was recorded for later transcription. The script for this study can be found in Appendix B on the section Focus Group with the Homeless People and Social Workers.

3.3.4 Results

Technology, Activities and Services

The use of technology seems prevalent among the focus group participants. Most participants either currently or previously had owned and used cell phones. Its use was mainly for sending text messages and making calls. The use of the Internet was also mentioned, although not specified if only through a computer or also through smartphones. Activities reported include visiting websites like social networks, house renting websites and the search of locations to afterward print the map. The main points of access to the internet through a computer were public locations like libraries and internet cafes. Other technologies participants used were radios and TVs.

Limitations

The first limitation presented by the participants was lack of knowledge and ineptness regarding technology. Being directly correlated with the age of the participant, meaning the older the more difficult was using technology and vice-versa. Another limitation was low income, resulting in the inability of using and owning technology since with low income was almost impossible buying a cell phone or paying a fixed data plan. Access to technology, like computers, internet or telephony, was also a problem due to lack of places with the technology available for free. One participant that had been in the situation of homelessness in various countries stated that in some counties access and use of

technologies is easier and cheaper for homeless people. Giving the example that with 1 euro a person could have access to telephony and internet through phone booth during a certain among of time and that information was more available and more accessible. The lack of information persistence also manifested itself, since the participants complained about losing their contacts and reminders every time they lose their cellphone.

Unfulfilled Information and Communication Needs

The following information and Communications needs were found:

1. Location and information of:
   (a) Where to get the help;
   (b) Social Canteens;
   (c) Dormitories;
   (d) Churches;
   (e) Shelters and Organizations;
   (f) Free Internet Spots;
   (g) Pharmacies;
   (h) information Posts;
   (i) Rounds and volunteers vans location;
2. News;
3. Weather;
4. Emergency Information;
5. Targeted Messages;
6. Customizable Information;

Participants Passivity

Although we were able to obtain some results during this study, they fell short of the overall objectives. The participants proved to be very passive with only one or two being more active and responsive. The card writing activity was the most successful phase during this study but when asked to discuss their opinions few or none responded. It was necessary to spend most of the time eliciting an answer from them and when it happens were mostly yes or no. From the last phase of the study, no feedback regarding possible features was given.

3.4 Discussion

Based on the previous studies, the perspective of both volunteers and homeless people regarding their relationship with technology seems to be mostly hand in hand. But the volunteer's perspective seems to be divided, one half receives positively the idea of developing technologies aimed at homeless people, while the other half states the opposite. This opposition always came accompanied with the argument that technologies should be developed for the volunteers and not the homeless people, showing a possible deficiency of technology support for the volunteers, implying that the flow of information between both stakeholders could be enhanced with the use of technology.

Regarding how stakeholders see homelessness, as a problem or a way of life[16], although not asked directly, both seem to be evenhanded. With both homeless people and volunteers suggesting and implying the need for direct and autonomous ways of obtaining information regarding places that would improve the homeless person quality of life. But also stating the need for easier access to information on how to leave homelessness, organizations, and shelters, implying the view of homelessness as a problem or as a situation someone wants to leave.

Regarding the two categories of technology use created by Roberson and Nardi [12], the use of technology for survival seems to be the most referenced and the most needed by both stakeholders. While the technology for social inclusion seems to be a less prevalent topic among the stakeholders, being mainly referenced in cases where getting information implies contact with someone, like the organization volunteers or other homeless people. The reason behind this may be the homeless preference of personal interaction [8] and the existing social network through which homeless people get most of the information in streets, implying a non-existing need of technology in this area.

Chapter 4

IVR Platform

After the studies described in the previous chapter, we had enough data to start developing a prototype of a platform aimed at supporting homeless people and their communications and information needs.

We developed an IVR platform that allows the homeless population to obtain information regarding points of interest, contact volunteers and social workers easily and remotely, create and receive reminders of their appointments, obtain information regarding the organization's routes, make requests to the organization and sharing information through an audio forum.

An Interactive Voice Response (IVR) system is an automated telephony system where interaction with the user occurs via DTMF (Dual-tone multi-frequency signaling) tones and voice. The information in an IVR system is outputted has a voice generated by speech-to-text synthesis, while the input can be given through a keyboard that generates DTMF tones or by speech recognition.

4.1 Use scenarios

Homeless People

Manuel is Portuguese, has 30 years old, has completed secondary school and lives in Lisbon. 6 years ago, the company where he worked went bankrupt leaving him unemployed. Since then he struggled to find a new job, leaving in a vulnerable psychological state and starting to suffer from alcoholism. Due to the fact of not having an income, he was not capable of paying the rent of the house in which he lived, forcing to go live in the streets. Now Manuel sleeps on the streets, and when available or in a state which he is capable, he does odd jobs to gain some money for his survival.

He owns a basic cellphone, which he uses to talk with his parents once a week. Before Manuel had great difficulty in finding public bathhouse and restrooms in parts of the new city in which he had never been before, but now he calls the Homeless Telephony Platform, inputs his current location and asks for the closest public bathhouse. Making his life easier and allowing him to keep his hygiene daily.

Due to is alcoholism sometimes, Manuel forgets is appointments, making his life very hard and unbalance since rule following and responsibility taking has been a problem for Manuel since he is living in the streets. With the platform, Manuel creates reminders for appointments, which the platform alerts him of periodically. Allowing him to have a more balanced life.

Since the income of Manuel has very low or non-existence income, every night he goes to the same location to obtain food from the volunteers during their routes. In the platform, he can obtain the volunteers' routes a find other places of where to meet them.

Manuel sometimes needs new clothes and since he is in contact with the volunteers, he requests them. But since he now uses the platform he can place directly and remotely his request through his cellphone.

Volunteers

Carlos is Portuguese has 28, has a degree in advocacy, lives in Lisbon and works has lawyer. Every fifteen days, he participates as a volunteer in the food distribution route as a pretext to getting closer to the people living in street and help them leaving homelessness. Since sometimes Carlos creates a bond with some people he finds living in the street and wants to keep contact with them, he uses the platform to add that person number to is personal contact list without actuality sharing contact number, and this away maintaining is privacy.

4.2 System Requirements

The developed system must target as many people as possible, so it should be developed for the most used technology among the homeless, the cellphone. Since the targeted population has low to none income the access to the system should not entail costs for the user. Also, as noticed during the focus group with the homeless people, most are not experienced users of technology and face many difficulties using them, so the design and interaction with the system should be kept simple, clear and direct.

The system should provide a catalog of information with points of interest and services targeted homelessness. The information should be easily attainable, by either enforcing a simple flow of menus or allowing a dynamic search of information. The points of interests should focus mainly on the following places:

- Where to stay during the night;
- Where to obtain food;
- Where to obtain clothing;
- Where to do the hygiene;
- Shelters and Organizations;
- Medical Services;
- Pharmacies;

4.3 Homeless Telephony Platform

The system created, named Homeless Telephony Platform, is an online telephony platform that aggregates static and dynamic information aimed at homeless people with the objective of mitigating the challenge of obtaining useful information. The platform also helps the organizations by facilitating and streamlining the communication between them and the homeless people. It runs as a Python Application using a MySQL Database. The full database entity relationship diagram can be found in Appendix D.

We choose a telephony system because, has previous studies have shown, technology use and ownership among homeless people exist, but to due to lack of steady income most own older technology, like basic cell phones. So, for the platform to be accessed by the largest amount of homeless people, we choose the least technology complex way of communication, the telephony.

The platform is accessed through a simple phone call with any telephony capable device, with the navigation being made either through numeric key presses and text writing using nine keys(T9) or through voice transcription.

4.3.1 Software architecture

The platform was developed using the Generic Telephony (GenTel), a Python application that includes all dependencies needed to run a telephony platform, including the interaction with the real-time communication application server FreeSWITCH[1], through the Python module Event Socket Library(ESL)[2] and text-to-speech synthesis through the Amazon Polly API[3]. Communication with the MySQL database is done using the object-relational mapping Python module Pony[4]. Regarding external APIs, the platform uses the Google Places[5], GeoCodings[6] and Distance Matrix s[7] Web API with JSON for collecting information regarding points of interest, addresses and distance between locations. The Google Cloud Speech API[8] is used for speech recognition, through the Python client library.

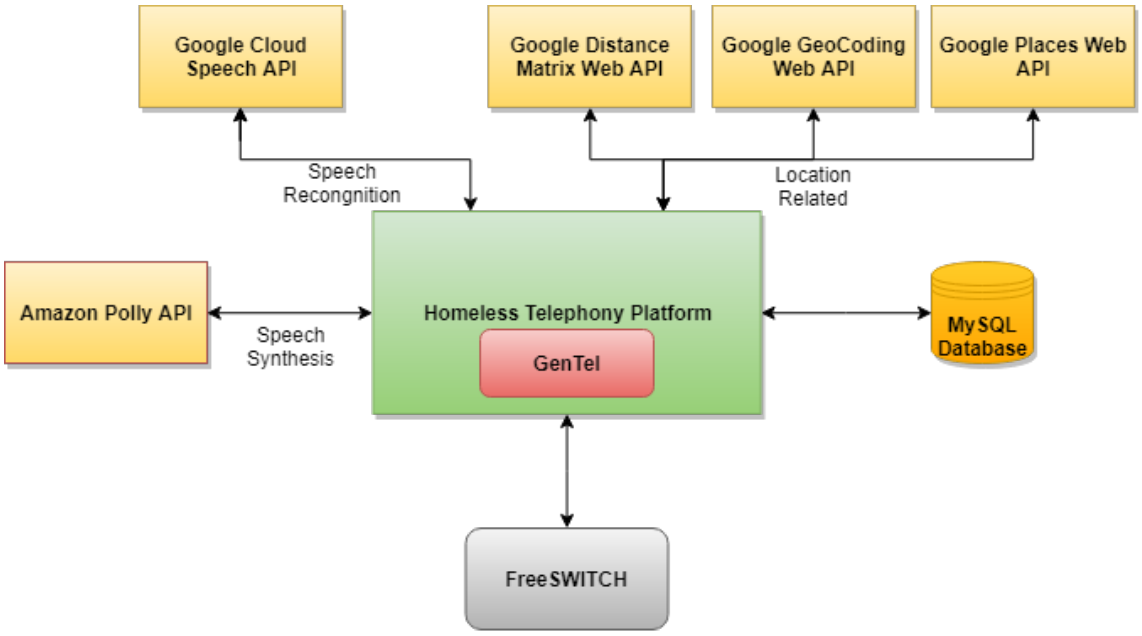


Figure 4.1: Software Architecture Diagram

4.3.2 GenTel (Generic Telephony Application)

GenTel works on a workflow-based model, where each workflow corresponds to a menu with an initial message and a set of options that are synthesized and presented to the user.

[1] https://freeswitch.com/
[2] https://freeswitch.org/confluence/display/FREESWITCH/Python+ESL
[3] https://aws.amazon.com/polly/
[4] https://ponyorm.com/
[5] https://developers.google.com/places/
[6] https://developers.google.com/maps/documentation/geocoding/start
[7] https://developers.google.com/maps/documentation/distance-matrix/start
[8] https://cloud.google.com/speech-to-text/

The system allows the creation of dynamic sequences of workflows, through a JSON file that is compiled each time the system is running. GenTel is also capable of doing scheduled calls, when provided a date of the call and targeted phone number. By default, the system has the following workflow types:

- Navigate Info - Presents database contents has selectable items;
- Navigate Media - Presents one or more recorded audio files;
- Navigate Options - Presents a list of selectable options;
- Submit Media - Allows to record and store audio;
- Hangup - Enables the system to hang up the call.

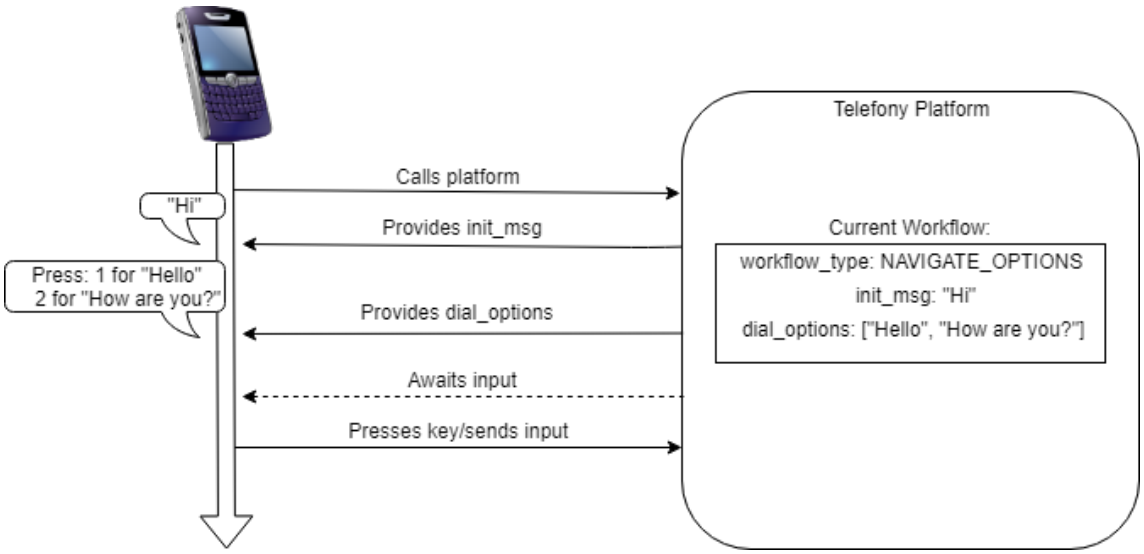


Figure 4.2: System Interaction Diagram

Figure 4.2 shows the interaction between the user and the telephony platform. First, the user calls the platform, which answers the call and selects the defined workflow. The workflow's initial message and dial options are synthesized and presented to the user. Each dial option was a numeric key associated. The user presses the desired key and the input is sent to the platform, which executes the action attributed to the selected dial option.

In regards to the database, a simple structure can be viewed in Figure 4.3, containing the following tables:

- The table 'Users' saves all data regarding the application user. A new 'Users' entity is created every time an unregistered phone number connects with the application. The table contains the following fields:

  - name - the name of the user;
  - phonenumber - phone number through which the call was made;
  - createdat - date of creation;
  - updatedat - date of update;

- The table 'Media' stores all data related to the audio recorded via the application and the audio regenerated from the text-to-speech synthesis through the Amazon Polly API. The table contains the following fields:
  - url - the audio file location;
  - description - the audio extension;
  - media_type - represents a previously specified type of media;
  - createdby - the user id of the audio creator;
  - title - the text content of the audio;
  - lang - the language code of the audio
  - vote - the importance level of the audio.

- The table 'Media_Child' allows associate 'Media' entities by storing the Id of two 'Media' entries.

- The table 'Alerts' represents a scheduled call and all the data regarding it. The table contains the following fields:
  - media - the id of the Media to be played in the call;
  - alert_type - represents a previously specified type of alert;
  - playout_time - the time in which call will be made;
  - completed - either the call has been completed or not;
  - createdat - date of creation;
  - updatedat - date of update;
  - workflow - the workflow that will be played on the call.

- The table 'Alert_Target' represents the target of the scheduled call, by associating an 'Alert' entity with a 'User' entity. The table contains:
  - id_alert - the id of the Alert;
  - id_user - the user id of the scheduled call target;
  - in_progress - either the process of alerting the user as started or not;
  - completed - either the call has been completed or not;

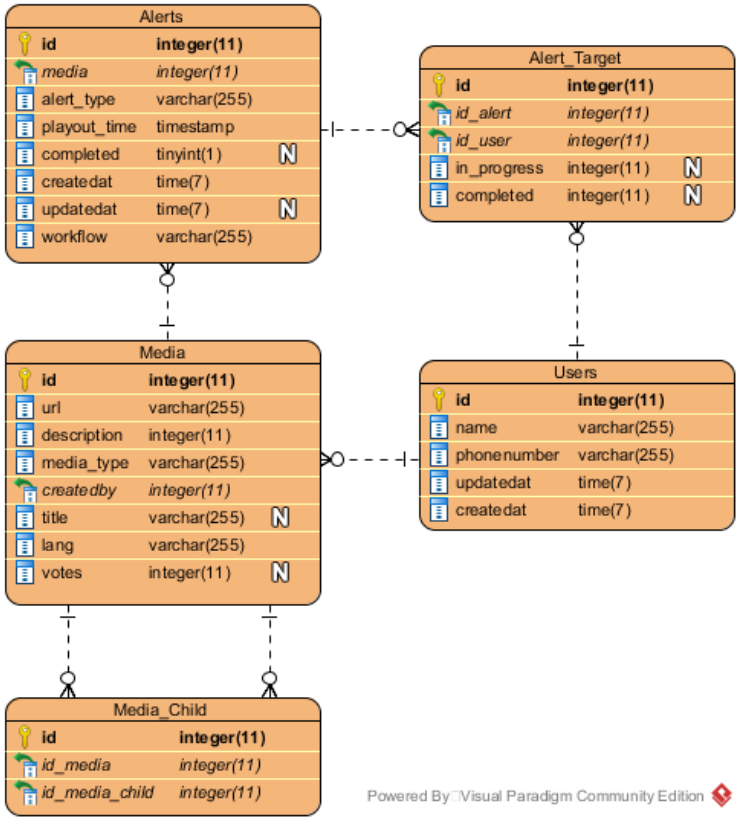


Figure 4.3: GenTel Entity-Relationship Diagram

4.3.3 Input Methods

Numeric Sequences

One of the first necessities found was the ability to write numeric sequences for inputting the time and date of a scheduled call. To achieve this, we developed three workflows that work interconnected.

The first called 'StartNumberSequence', at a user level, emitted a warning message saying that the input of a number sequence was about to start, requesting the user to press '1' to start the input or to press '2' in case the user wanted to go back. At a programming level, in this workflow it could be defined the expected number of digits in the sequence, what the sequence represented, the numeric interval in which the sequence must be, if it should be read digit-by-digit, if in case the sequence achieved the expected number of digits should terminate the input listening or not and allowing the storage of an id of a previous numeric sequence.

The second called 'EnterNumberSequence', allows the user to input the number through the phone keyboard. Every time a key is pressed, the digit is added to the sequence and a voice representation of the sequence, either digit by digit or as a whole number, is presented to the user. The user can also erase the last digit by pressing ''. To terminate the sequence input the user can press '#' or it may terminate automatically in case end input

on sequence size is activated. When the input is terminated the workflow checks if the size corresponds to the expected size and if the number is between the allowed interval. If the conditions are true, the sequence is passed to the next workflow, else start the input sequence again.

The final workflow is called 'SubmitNumberSequence'. This workflow presents the sequence previously inputted and asks the user if it is the desired numeric sequence. If true, the sequence is stored in the database along with its type.

Writing Text

After achieving the possibility of writing numeric sequences, I found that writing text could be useful to allow dynamic information and better navigation in the platform. To achieve writing through a phone call I developed a workflow that implemented a version of T9(Text on 9 Keys) but without the word suggestion and dictionary functionality. Following the T9 specification, every 3 letters of the alphabet are associated from numeric key '2' to '6' and key '8', with 4 letters associated to key '7' and '8'. To get the next letter associated with a key, the user must press the same key within less than 1 second, else a new letter will be written. To erase the last letter the key '' could be pressed and to input whitespace, the key '0' could be pressed. Pressing '#' will stop the text input and store it temporarily, for later use in the call session. In regard to the feedback of the word being written, works like the previously described workflow 'EnterNumberSequence', every time a key is pressed a new character is added to the text being then synthesized and presented to the user. This workflow also allows the input of numeric sequences by setting the option 'keyboard_numeric' to true.

Audio Transcription

Since inputting great amounts of text through numeric keys is prone to too many spelling errors, it could become tedious and not useful in time restricted situation. In response, we implemented a workflow that transcribed audio from a previously recorded audio file. This workflow is based on the 'Submit Media' workflow that exists on the GenTel, but in this case instead of recording the audio and storing its related data in the database when '#' is pressed, this workflow records the audio in a temporary file and uploads the file to the Google Cloud Speech service through their API to obtain a transcription.

Writing or Transcription

Since the preference for writing or for audio transcription can vary from person to person and from situation to situation, we created a workflow that merges both text writing and audio transcription, leaving to the user which option of input to use. When the user enters this workflow, the audio will start to be recorded if the user wants to use audio

transcription it only as to say the desired text and pressed '#'. If the user wants to input text manually must start to input the text using the numeric keys, which stops the audio recording and starts the behavior described in the Writing Text section.

4.3.4 Location

As previous studies have shown, the information and location of places that enhance the quality of life and well-being of homeless people are not easily obtained for people leaving in the streets and specialty to newly homeless people. In response to this need, we developed workflows that adapted some functionalities of Google Maps to be accessed and presented through telephony. The platform allows general searching for places, including buildings and streets, and allows the user to obtain places of interest in his vicinity by providing his current location. Figure 4.4 displays the system flow and the components of the platform's location functionalities. Given the limitations of the Gentel, 6 new workflows in the location context were developed:

SEARCH_PLACE This workflow receives a string previously inputted by the user and sends it to Autocomplete service present in the Google Places API. This service returns a list of matching places given the current country and the workflow saves the id of each result and presents the name of each, allowing the user to select the desired option through the numeric keys. The select place id is then saved the current user session.

SET_MY_LOCATION Given a place id, this workflow sets the place referenced by the id has the current location of the user. It also registers this information on the history of locations visited by the user

LOCATION_DETAILS This workflow receives a place id and sends it to the Place Details service of the Google Places API. This service returns a JSON file containing all data regarding sent place id. The platform converts the JSON file into an object and catches the following place data: name, address, phone number, and weekly schedule. When the user enters this workflow is presented with the name, address, contact and the schedule of the current weekday. And gives the options of listening to the full week schedule if key '1' is pressed, the full address if key '2' is pressed and key '3' to listen to the place contact.

USER_NEARBY_PLACES This workflow allows the user to obtain places of interest near his position. The workflow is given a previously specified type of place and the user current location id stored in the database, using the Nearby Search service of the Google Places Web API, obtains a list of places ordered by distance. Since the results given by the Places API do not include the distance of each place in relation to the user, I used the Google Distance Matrix Web API to the distances.

The results are presented to the user through a list bounded to the numeric keys, presenting firstly the name of the place and after the distance to the user. When a place is selected its id is stored in the session for later use.

SELECT_PLACE_TYPE This workflow is based on the Navigate Options workflow, where each dial option represents a type of place of interest. The types of place present are the following: food, health, pharmacy, bus station, and train station.

LOCATION_HISTORY Presents a list of previous places set as the current location.

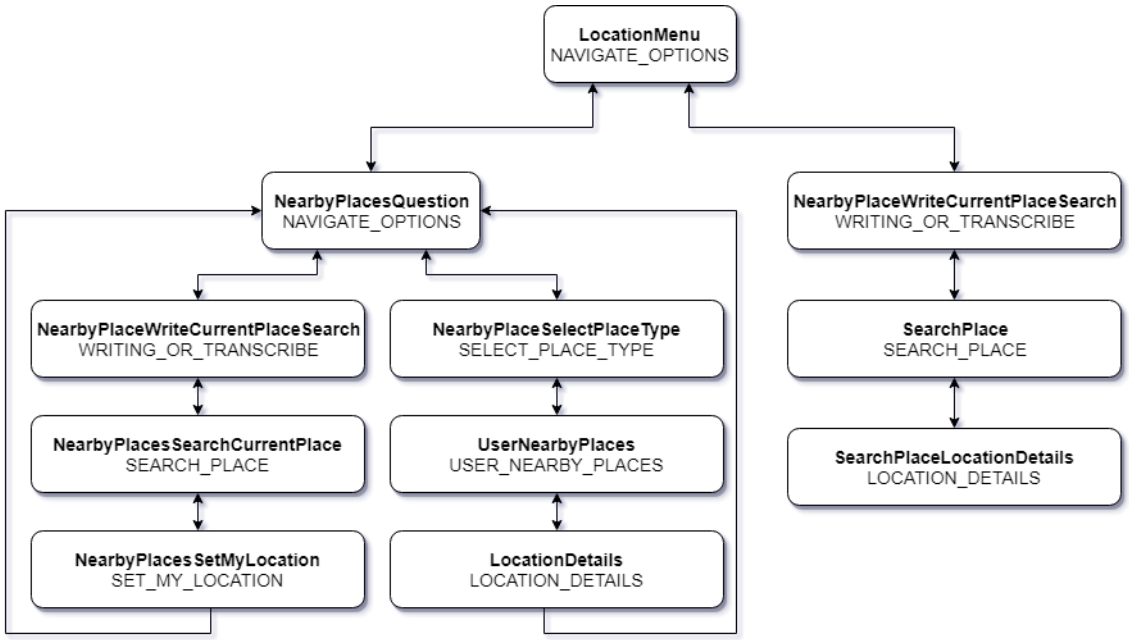


Figure 4.4: Location Workflow Sequence Diagram

The flow starts (LocationMenu) by giving two options: pressing '1' to obtain the nearby places of interest, pressing '2' to search for a location or pressing '3' to obtain a history of places visited. By pressing '1', the platform enters the 'NearbyPlacesQuestion' workflow, that presents the last location the user-defined has current in the system and asks if the user wishes to change it.

If the answer is yes, the user is prompt to input the new location. This input is then used by the workflow 'NearbyPlacesSearchCurrentPlace' to query the Google Places services and obtain a list of matching locations. By selecting one of the locations a new current location is set and store in the database.

If the user answers no, the user is asked to select a type of place of interest from the list presented (NearbyPlaceSelectPlaceType). The system then executes the 'UserNearbyPlaces' workflow that presents all places of interest by order of proximity to the user. By selecting a place, the user can obtain details regarding the place.

On the 'LocationMenu' if the user presses '2', is prompted to input a search term that is then sent to the Google Places services, obtaining a list of matching locations from which the user can obtain details. If the user presses '3' obtains the list of all locations previously declared as current locations.

In regards to the database, three new tables were created(Figure 4.5): the 'Current_Location' table, that stores the place id used by the Google services and the id of the user to which this current location is associated with; the 'Location_History' table, that stores the place id and name of all previous current locations and the id of the corresponding user; the 'Location_Search_History' table, that saves all searches done by a user. The table stores the user id, the place id and the search term associated.

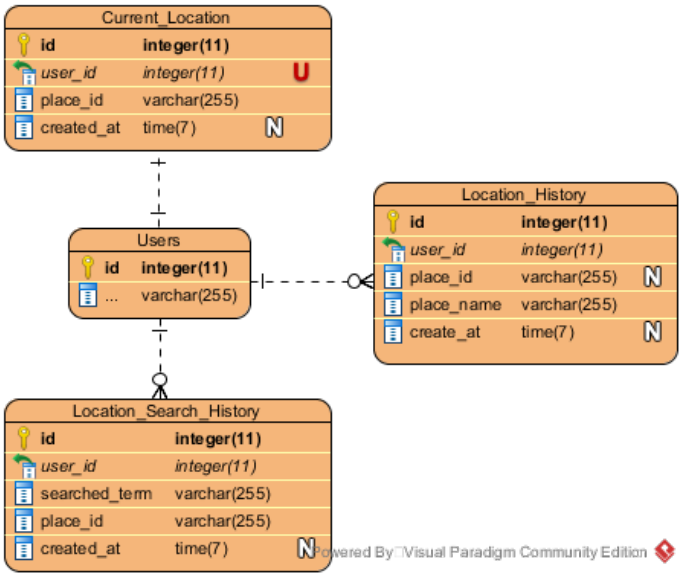


Figure 4.5: Location Entity Relationship Diagram

4.3.5 Contact List

During the food distribution route and by talking with the volunteers we found that some volunteers messaged, with their private phones, people they found living in the street with whom have developed a relationship and wanted to help. To enhance the communication between volunteers and the homeless people, I developed a feature that allows asynchronous communication by recording and sending voice messages between two users, without having to input a number since the message is associated to a user a not a number, safeguarding the people private phone numbers. Each time a new message is sent, the receiver is called by the system, presenting the audio message recording by the emitter.

Figure 4.6 displays the flow and the components that enable the asynchronous communication. When the user enters the 'CheckContactList' workflow is presented with a list of names to which he can send a message. After selecting a name, two options are

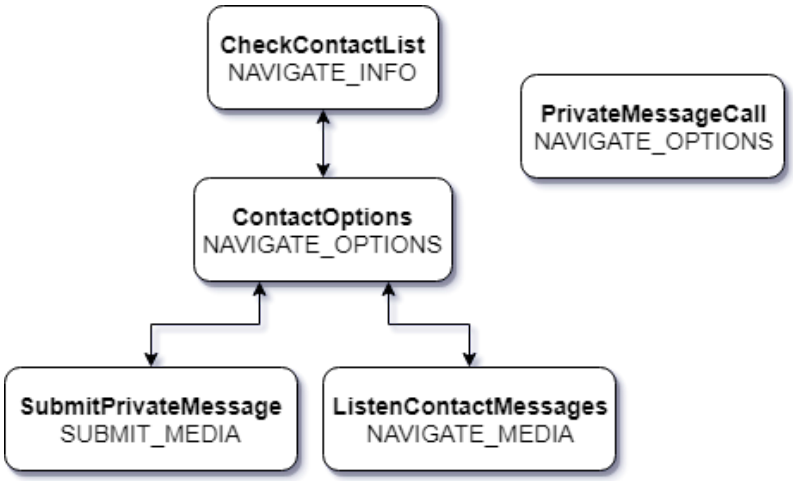


Figure 4.6: Contact Workflow Sequence Diagram

given: pressing '1' to record a new audio message or pressing '2' to listen to the previously exchanged messages with the selected user. When an audio message is recorded, the selected user will receive a call from the platform executing the 'PrivateMessageCall' workflow, which presents the name of the emitter, the recorded audio and the date of creation.

In the database, two new tables were created(Figure 4.7): the 'Contact_List' which stores two user ids and adds the two users to each other contact list; the 'Private_Message' table, which stores the user ids of the emitter and the recipient of the message and the Media id relative to the message content.

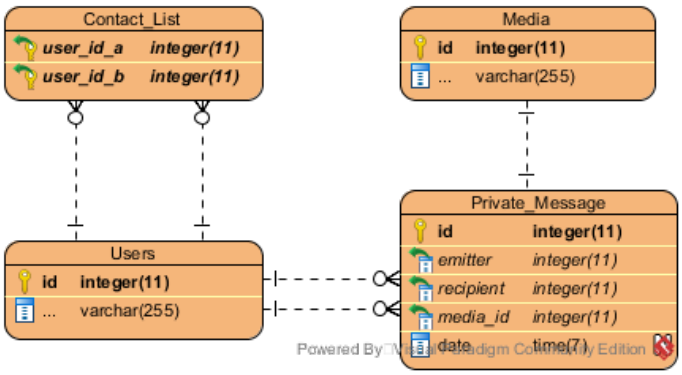


Figure 4.7: Contact Entity Relationship Diagram

4.3.6 Reminders

One of the difficulties homeless people face, described by the volunteers, is maintaining a schedule and attending appointments, which complicates their process of reintegration in mainstream society. In an attempt to mitigate these difficulties, we developed a sequence

of workflows that allows the user to create reminders to himself or others and listen to previously created reminders. The user is then alerted by a call from the platform.

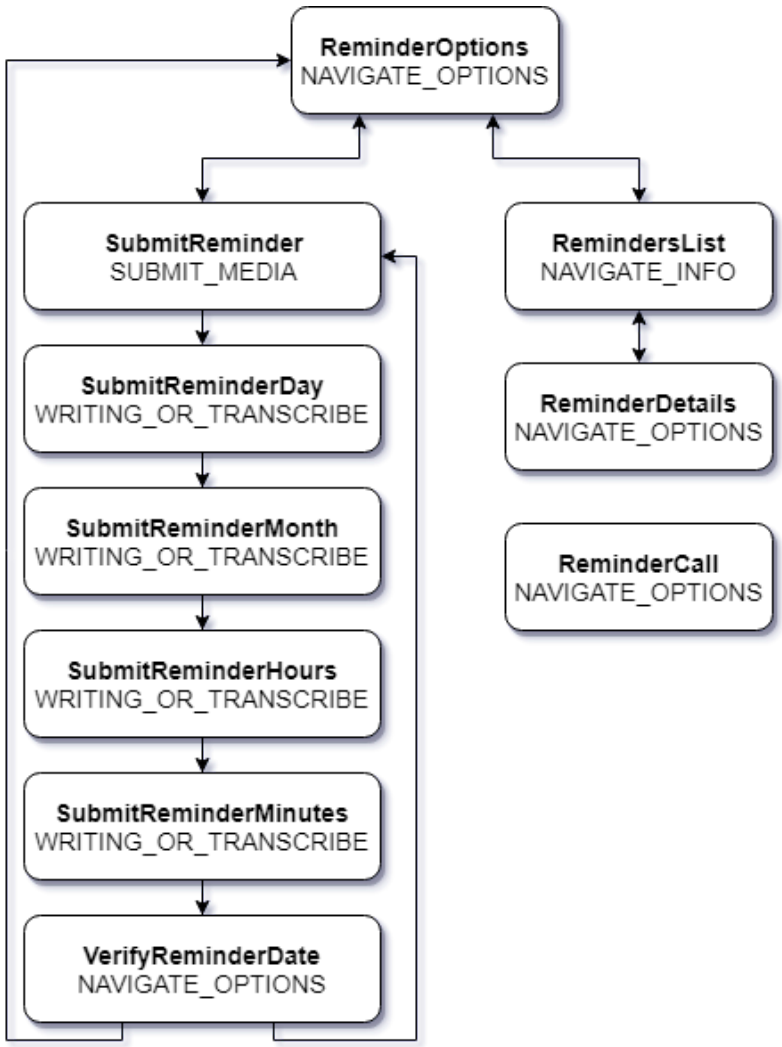


Figure 4.8: Reminder Workflow Sequence Diagram

Figure 4.8 displays the flow and the components that enable the creation and listening of reminders. To access this functionality the user is present with the 'ReminderOptions' which has the following dial options: press '1' to create a new reminder or press '2' to listen to previously created remainders. The process of creating a reminder is divided into five phases: recording the content of the reminder, inputting the day, inputting the month, inputting the hours and inputting the minutes. Before creating the reminder, the platform presents to the user the inputted date to be validated. To listen to the previous reminder, the user must press '2' in the 'Reminder Options' workflow, which presents a list of selectable dates, each corresponding to a reminder. Then the date associated with a reminder is near, the user receives a call from the platform, presenting the recorded audio and the date of the appointment.

The table 'Reminder' was created in the database (Figure 4.9), storing the id of the reminder owner, the id of the alert associated to the reminder and the date in which the alert will happen.

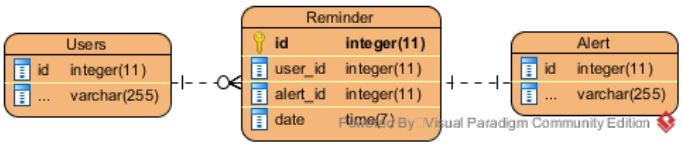


Figure 4.9: Reminder Entity Relationship Diagram

4.3.7 Routes

Another problem homeless people face is obtaining information regarding the routes and the stops points of the distribution routes done by the volunteers. This information is only obtainable through direct contact with the volunteers and organization or through word of mouth with other homeless people. To provide this information, we developed a sequence of workflows that presents all routes and its stop points, allowing the user to listen to the address or relative location inserted by the organization and the approximate time of arrival to each stop. The platform also allows the user to subscribe to a route point, to receive an alert when the approximate time of arrival is near. The objective of the functionality is, on one hand, facilitate the volunteers' job by diminishing their necessity of searching for the homeless people in each stop. And on the other hand, diminishing the passivity of homeless people by providing them with information, making them capable of approaching the volunteers at their own volition without needing to wait unnecessarily.

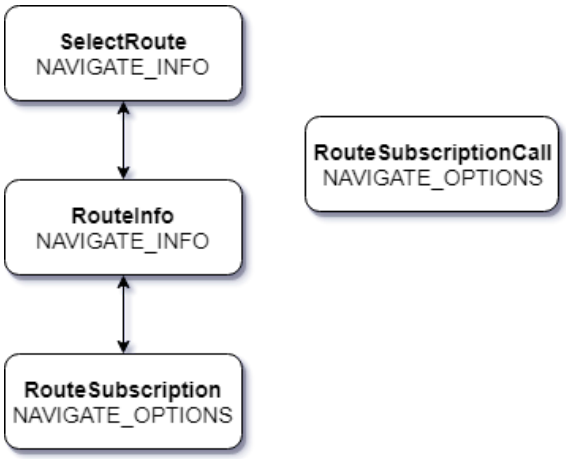


Figure 4.10: Route Workflow Sequence Diagram

Figure 4.10 displays the flow and the components that enable the access to the routes information. Then the user accesses the 'SelectRoute' workflow is presented with a list

of all selectable routes. By selecting the route, the system presents a selectable list of all points of the route, describing its address or, if previously inserted, its relative location and the approximate time of arrival. Selecting a route point will prompt the user to answer if he wishes to subscribe to the selected point. When a point is subscribed, and the time of arrival is near the user will receive a call from the system, with the route point information.

In the database, four new tables were created(Figure 4.11): the 'Route' which represents a route in a unique name; the 'Route_Point' which stores the id of route, the address or relative location of the point and its latitude and longitude; the 'Route_Point_Time, which stores the various approximate times of arrival to the route point; the 'Route_Subscription', which stores the subscription of a user to a route point.

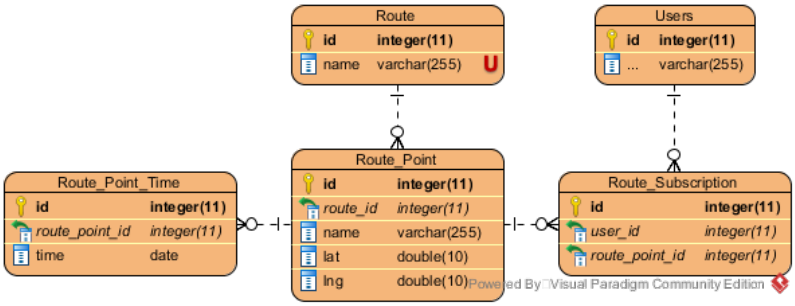


Figure 4.11: Route Entity Relationship Diagram

4.3.8 Tickets

By speaking with and observing the volunteers during the distribution routes, we gathered that the organization takes requests for clothes and other necessities from homeless people. But these requests must be made face-to-face with a volunteer, making possible to satisfy their needs only days later thus decreasing the effectiveness in meeting the needs of homeless people. To address this issue, I developed a ticket system that allows the user to send private requests to an organization, allowing his social workers to manage the requests, answer them and share information among the social workers and volunteers to answer the request in the most efficient manner. Two new types of workflows were created:

TICKET_MENU The Ticket Menu workflow presents an audio ticket previously recorded by the user and allows him to listen to responses by pressing '1', close the ticket by pressing '2' and entering the discussion menu by pressing '3'.

DISCUSSION_MENU This workflow allows the user to listen to the discussion of a specific ticket and to add his contribution to the discussion by adding a response. This objective of this workflow is to be only available to organization's social workers and volunteers.

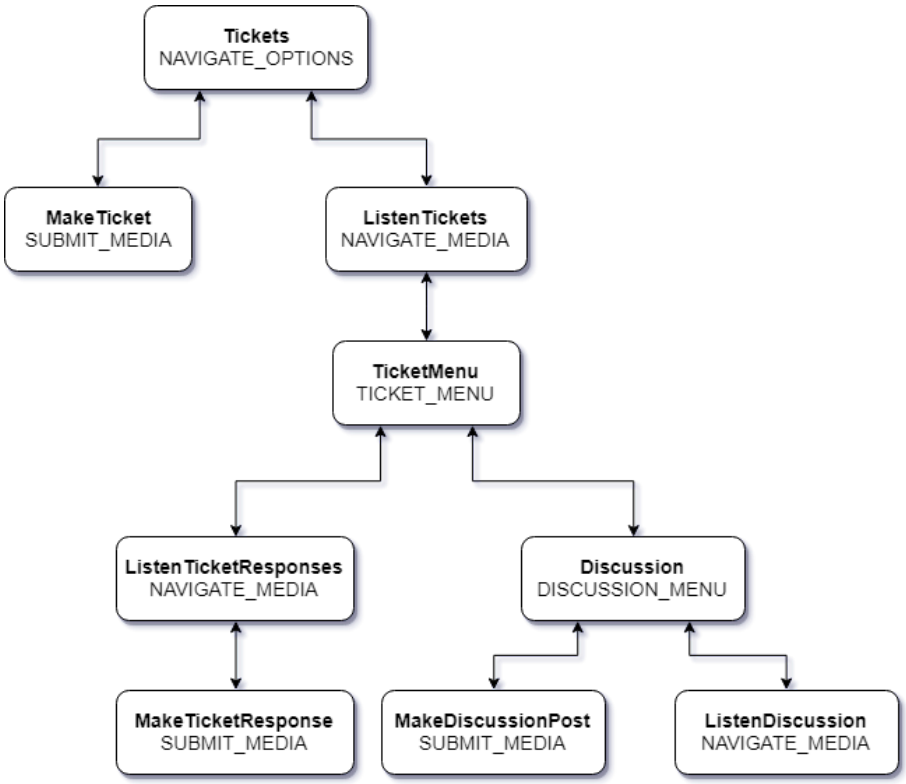


Figure 4.12: Tickets Workflow Sequence Diagram

Figure 4.12 displays the ticket system flow and the components. The system starts by presenting two options to the user, either pressing '1' to record the content of a new ticket and submitting it or pressing '2' to listen to existing tickets. By selecting an already created ticket, the user is presented with the 'TicketMenu' workflow, described previously. After listening to the previous answers, the user can submit his own response, allowing a conversation between the homeless people and the social workers. If a user is a social worker/volunteer it can access the 'Discussion' workflow and help in the request accomplishment.

4.3.9 Forum

To promote the communication between all stakeholders and ensure the persistence of essential dynamic information, we developed a forum-based system that allows the creation of topics on a specific forum category. All topics are public and both homeless people and volunteers/social workers can post topics and answer them. A new type of workflow was created for the concretization of the forum:

Forum Category This workflow presents a forum topic of a given category. When the user enters this workflow is presented with an audio recording of the topic and is presented with the following options: press '1' to listen and submit answers, press

'2' to vote in the topic, press '3' to listen to the topic again. press '' to go to the previous topic and press '#' to advance to the next topic.

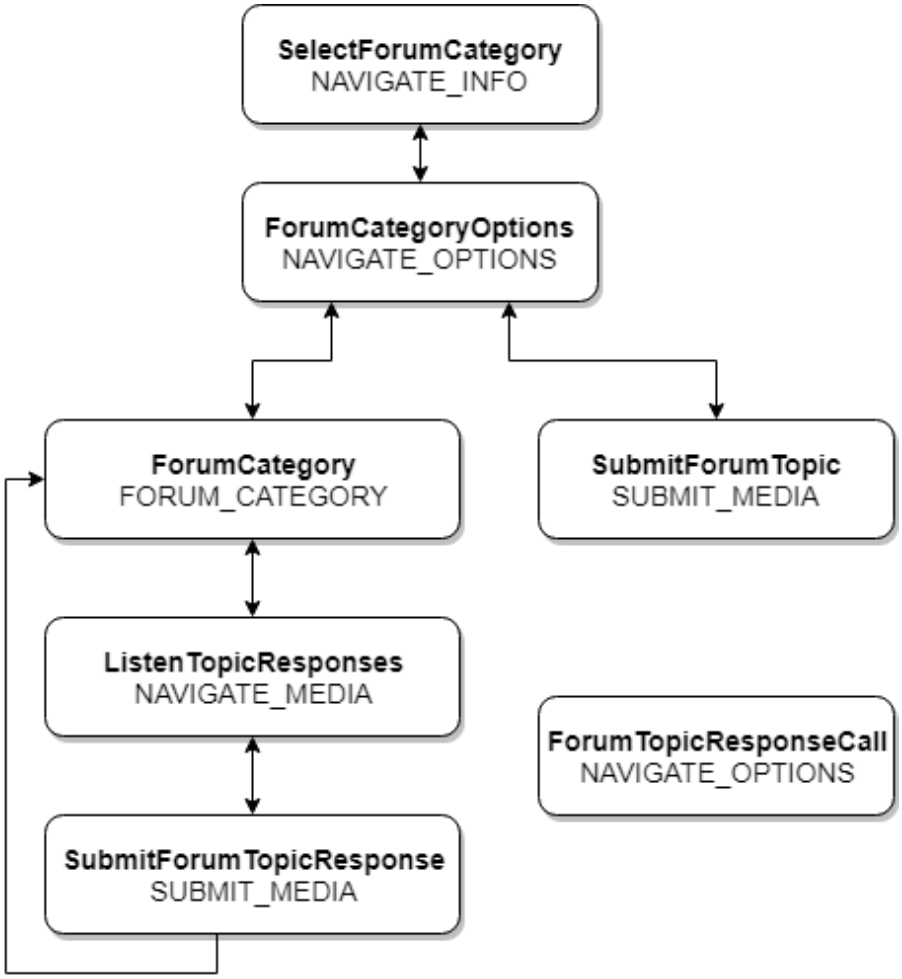


Figure 4.13: Forum Workflow Sequence Diagram

Figure 4.13 displays the forum flow and its components. When the user enters the forum, the platform presents him with a list of selectable categories, previously defined and stored in the database. After selecting the category, the user is presented with two options: pressing '1' to listen to the existing topics in the selected category and entering the previously described 'Forum Category' workflow or pressing '2' to record and submit a new topic. Whenever a user submits an answer to a topic, its creator receives a call from the system with: the topic content, the name of the person who responded and the audio of the response.

To store the forum categories a new 'Forum_Category' table was created in the database(Figure 4.14). This table stores the name of each category and the type of media associated with the topic of this category.

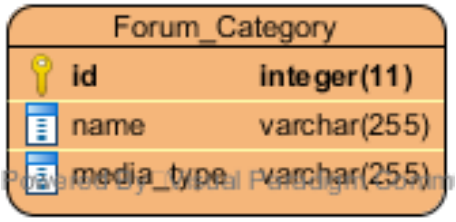


Figure 4.14: Forum Entity Relationship Diagram

4.3.10 Remote Account and Authentication

Since homeless people tend to change of devices due to the nature of homelessness, having the platform identifying the user calling through the phone number can render the platform useless in terms of personal data persistence and privacy, because all private content created by the user will no longer be accessible and if someone else finds the device can easily access to the user private information. To try solving this problem, we implemented a system of authentication with username and password, allowing registration and logging through telephony. Although functional, this feature is purely a mock-up, since no real security algorithms are being used to protect the input and its storage.

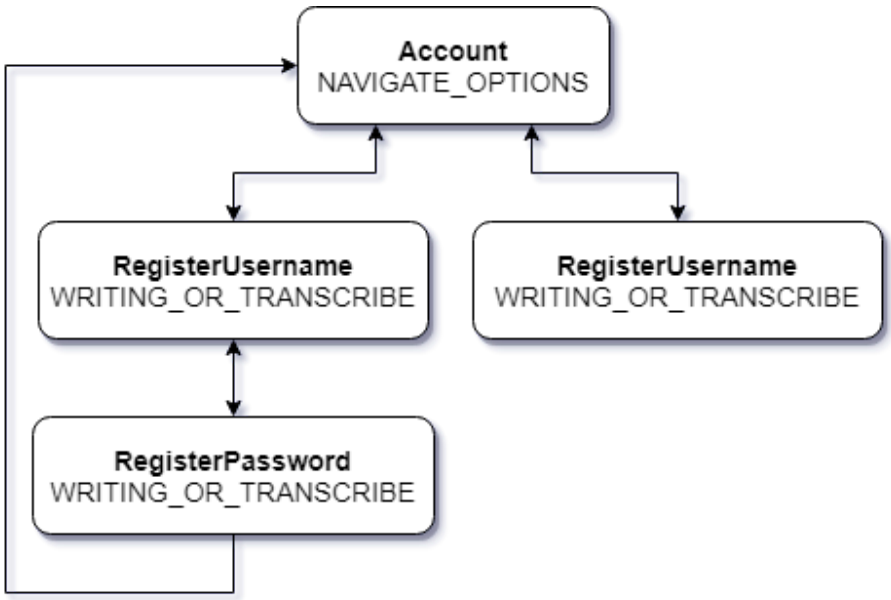


Figure 4.15: Account Workflow Sequence Diagram

Figure 4.15 displays the authentication flow and its components. When the user enters the 'Account' workflow, is presented with two options: press '1' to register in the platform or press '2' to log in. By pressing '1', the platform prompts the user to input his new username followed by inputting the password twice. Pressing '2' prompts the user to log in by inputting his username and password.

4.3.11 Prototype Deployment

At the end of the development, all features were united under a main menu that allowed access to the previously described features. To allow the prototype to be accessible through a phone call, the platform was deployed on a Debian Linux 8 machine on Amazon AWS through the web service EC2[9]. To connect the web platform to the telephony network and have a callable phone number attributed, we used the Twilio Elastic SIP Trunking.

[9] https://aws.amazon.com/ec2/

Chapter 5

Prospective Evaluation

During this phase, our objective is to show the developed prototype and obtain feedback regarding its functionality, perceived usability and necessity fulfillment among the different stakeholders in the homeless sphere. We also continue our search for new unfulfilled needs that may have escaped us in previous studies. We started performing focus groups with the volunteers, followed by people who started the process of abandoning homelessness and finally with social workers.

5.1 Methodology

The performed focus groups consisted of presenting a set of features of the platform, following a specific scene and asking the participants for feedback and new ideas. In all focus groups the audio was recorded, with the given authorization, of the participants, and written notes were taken, for later analysis. The script for this study can be found in Appendix C.

For the volunteers and social workers, we presented the location, contact list, account, reminders, routes and tickets features. For the session with the homeless people, we only presented the location, the tickets, and the routes features. The forum was left out of both sessions due to time constraints.

The scenes for showing each feature were the following:

- Location - The user is at the shelter and wants to find the closest pharmacy and its schedule.
- Contact List - The volunteer wants to send a private message to a homeless person he previously found on a night round.
- Reminders - The volunteer finds a homeless person during the round that has a medical appointment and the volunteer wants him to remember it.
- Routes - The user wants to know where and when the organization's vans pass and wants to be warned when the van is on a specific location.
- Tickets - The user needs a blanket and does not know where to obtain it.

5.2 Focus Groups with Volunteers

5.2.1 Participants

We performed two focus groups with distinct volunteers. The first had 6 participants and all the women, the second had 3 participants, 2 men, and 1 woman. The focus groups were performed face-to-face and in the organization building, before the start of the food distribution routes.

5.2.2 Results

Technology, Homeless People and the Platform

All volunteers said that homeless people use or own cellphones, although still a minority. The impact of homelessness on technology is also referenced by the volunteers, like the loss and change of cellphones, the difficulty in paying a data plan or of recharging their devices.

In relation to the platform, the volunteers wanted it working 24 hours a day and wanted training on how to use it, to later spread the knowledge to the homeless people during the during rounds. Declaring that would be a great conversation starter. The volunteers also question us if the platform would be extended to other institutions because for them would increase the platform's reach.

Security and distinct stakeholder access

In the context of security, in both focus groups, the volunteers expressed their concern regarding how distinct stakeholders could access the platform without putting in risk private information. Suggesting that volunteers, homeless people, and unregistered people should be allowed to access different features and imposed distinct limitations.

User Interface

The first focus group faced the IVR interface and its navigability with criticism. In the opinion of these volunteers, the existence of many and long audio-delivered menus and the difficulty in perceiving the synthesized text poses a problem for the homeless population. Because they do not have the patience for listening to all the options presented, which will lead them into unwanted menus and consequently backtracking, creating poor navigability and bad user experience.

Due to the lack of education, not using technology on regular basis, the prevalence of psychological problems and addictions, the act of having to navigate through several sequential menus to achieve the pretended information may pose a challenge. This complexity will lead the homeless people to only call the platform once, never using it again and propagating their poor experience using the system with their peers, making the platform useless.

A solution presented by the volunteers was, instead of menu navigation-based user interface, a natural-language user interface like Apple's Siri. Meaning that the homeless people would make questions and ask for the services speaking directly with the system, without needing menus.

Shift Platform Focus

An opinion that the first group of volunteers presented was that most information available on our platform is already available through other means that homeless people know how to use, like through searching on the internet and on social media platforms.

For the platform to be more relevant it should have fewer features and only be used as a tool for communication between the homeless people, the volunteers and the institution. This means that we should not focus on external information and focus only on the communication between stakeholders.

On the idea of changing the platform focus, the volunteers suggested three features: the reporting of situations found on the streets, information regarding the institution centers and access to the profile and history of the homeless people they find during the rounds, including the medical record, since sometimes they do not anything about the person they encounter. They also consider that the platform should be able of re-forwarding the call to other emergency services, like 'SOS Voz Amiga'.

Functionality Refinement

Regarding the location functionality, the volunteers found it very useful, enforcing that the most important points of interest for homeless people are: places and institutions that provide food, warm places during the winter, public bathhouses, restrooms, and shelters. Regarding the shelters, volunteers think that more dynamic information like the current shelter location would be very useful for homeless people.

The route functionality was also well received by the volunteers, but our understating on how the routes work was incorrect. We understood that routes had a fixed set of points and that volunteers visited points always by the same order, making it possible to give a fixed time estimate on when the volunteers arrive at a route point. In reality, routes have a fixed set of points, but the order in which they are visited varies, depending on the day, whom they encounter and on the van driver. The volunteers also pointed the problem of homeless people not having the notion of routes, since they always meet the volunteers in the same point or nearby, making the current way of presenting the routes by name useless and confusing. Although, for newly homeless people, who do not know the organization and the route points, would be extremely useful.

Even if the routes were always done by a specific order, a correct fixed time of arrival to a point would be impossible to define, because the time taken in a route point varies from 5 minutes to half an hour, depending on the number of homeless people that appears and on how willing they are to talk with the volunteers. This variation of time accumulated over different points of the route causes the routes to sometimes ending at midnight but other times at two in the morning, making homeless people sometimes wait a long period of time or give up waiting.

A possible solution presented by the volunteers would be alerting the homeless, not based in a fixed time, but based in the current position of the van and the distance to next route point. To solve the second problem, the volunteers suggested the get nearby points of interest functionality to include a way of also obtaining the closest route point to the user. Volunteers said, that even if the time presented in the alert is not precise, what matters is informing homeless people that the volunteers are on their way to the subscribed point or that have already passed by that point, making the difference between waiting 15 minutes or 1 hour. They also warn us of not presenting this feature as something that will end the waiting and of not making the points as a place to only obtain food, since the food

is only a pretext to talk with the homeless people and help them.

About the contact list, the volunteers found it useful, especially when they want to be able to contact a homeless person remotely, but do not trust him enough to give him their private number. Because in both sessions, volunteers revealed that sharing private numbers had generated problems previously, like unwanted conversations and privacy evasion. But volunteers admitted that at a certain level of relationship they find natural to share their private number with the person they trying to help. They also questioned if it should always be volunteers communicating with the homeless person, since they may ask something that the volunteers do not know. Suggesting a sorting and filtering of the message contents and redirecting the message to a knowledgeable stakeholder.

The ticket system was also received positively. Since volunteers can only support the homeless during the night, this system would allow supporting the homeless people during the day. In the opinion of the volunteers, it is possible that during an hour lucidity or of a strong desire to leave homelessness, if a system like this is available, the probability of homeless people asking for help is higher. Due to the many types of needs a homeless people may have, like housing and necessities, it was suggested a sorting of the requests.

The reminders were received with mixed reactions. On the positive side, volunteers said that since they must remind the homeless people of their medical appointments, a tool that allows to alert them remotely is welcome. On the negative side, some volunteers think that even with alerts on their cellphones, homeless people would not answer the calls and not show up to the appointment. Another problem is the fact that some homeless people use phones of private places, like stores, in which they must ask the owner permission to use it. If this phone is registered in the platform, it could become cumbersome for both phone owner and homeless people, because the homeless person would lose the alerts and the owner of the phone would receive unwanted alerts.

5.3 Focus Group with Homeless People

5.3.1 Participants

This focus group was performed at a social reintegration center for homeless people, with 6 male participants and a social worker.

5.3.2 Results

Homeless People and the platform

All participants received the platform and all its features positively, stating that all presented features are useful to someone facing homelessness and due to the platform being a machine it is easier for them to obtain information because they do not need to expose their current life situation.

Homelessness Problems and Needs

During this session, the participants described some of the problems they face in their life has homeless. They expressed the necessity of having access to human right defenders or lawyers because they are abused by people in positions of greater power. But since they do not have the resources to fight back and people do not think they are credible, they end up being involved in many injustices.

Another problem they expressed, was the difficulty in finding a job. Even if someone wanted to hire them, the contractor would need an address or curriculum and most of the times, homeless people do not have either. They also referred to the social stigma they feel due to the consumption of drugs and how often their passports and documentation is stolen during the night.

They also expressed what they considered the three major information needs for a homeless person: where to obtain food, where to take a shower and where to communicate with social worker.

Platform Requirements and Recommendations

The participants reported that the navigation on the platform should be the most direct possible, with concise and easily identifiable options. The voice of the platform should use a perceptible vocabulary and have good diction, due to the low audio quality of the phone calls, the environmental noise surrounding the caller and language barriers. They proposed that the platform should be available in, at least, one more language, like English, because many homeless people are foreigners and do not speak Portuguese. The availability of the platform information through other devices was also brought up by the participants, expressing that it would be advantageous to access it through both computer and mobile phone application, allowing a better information understanding, thought its visualization in maps and images.

Locations

Regarding the location feature, the homeless people found it useful, stating that is an innovative idea and that would allow the access to information quickly. They recommend the location by reference points, instead of the current location address. Although the type of nearby places already found in the platform was considered useful, they recommended the presence of the following locations:

- Workplaces and companies;
- Service centers of institutions like 'Liga Portuguesa Contra a Sida';
- Emergency places;

- Public bathhouses;
- Methadone vans;
- Social canteens;
- Free clothing organizations;
- Free clinics, because if a homeless person does not have the money or a source of income, the clinics are the only place where they can obtain medical examinations and medicines for free. Making our example of finding a pharmacy not very useful;
- Hospitals;
- Police;
- Embassies, since it would be useful for those arriving in the country without documentation or those who get robbed during the night and are left without their documentation.
- Public WCs, because finding a working and in good condition WC is a challenge for people living the streets. The lack of this knowledge leads people to sometimes do their necessities in public places, at the risk of being discovered by other people and leading to moments of tension.
- Laundries;
- Public Libraries;
- Places to access telephony;
- Places to recharge devices;
- Social Assistance/Social Emergency;
- Bureaucracy related;
- Location and Information on self-helping organizations like Alcoholics Anonymous and Narcotics Anonymous.

5.4 Focus Groups with Social Workers

5.4.1 Participants

This focus group was performed at a social reintegration center for homeless people with 9 social workers from various areas of activity within the organization.

5.4.2 Results

The Platform

The social workers received the platform rather positively, expressing their concern regarding the necessary training to use the platform for all stakeholders involved, including social workers, volunteers, and homeless people. They also expressed the need for the platform to be in other languages, since they receive many people from foreign countries, like Russia and Romania.

Reminder

The social worker found the reminder functionality useful and productive because currently, they warn homeless people of their appointments through text messages, which requires the social workers to write manually the message to each person every couple of days. They recommended that in an initial phase this functionality should only be available to social workers and only later to the general platform users.

Personal Account

Regarding personal accounts, social workers said we could risk the deployment of this feature and evaluate its use and usefulness. They suggested that this functionality should only be available for people who started the process of abandoning homelessness at the shelter and that should contain the profile of the user, their contacts, their history and serving as an organizer of their tasks in the temporary shelter. The social workers do not see homeless people using this functionality due to its complexity but stated the possibility that some could use it. We asked social workers on how should the user register and login in the platform through telephony, they suggest that when a user calls to the platform to be asked if wishes to be a regular user and if the answer is yes the user would receive a text message with its login information. Another suggestion was having the user identified by his account in the system and not his phone number, because the homeless people change phone number very often, due to their use of prepaid phone cards.

Contact List

Although this feature was well received, the social workers think that the first contacts homeless people will search are the contacts of care services, the organization phone number or other institutions aimed at helping homeless people.

Location

For social workers, the location functionality should give priority to care services from the organization and other institutions aimed at supporting the homeless, like 'Santa Casa

da Misericórdia' and the shelter 'VITAE'. They suggested public bathhouses, social canteens, and clothes deposits as points available in the platform, but also said that each social worker should do a list of points of interest and cross the data to obtain the most important spots. Regarding how the functionality worked, they warned us that too much information could lead to users losing themselves in the platform and that listening to the phone number and having to write it down somewhere was confusing, increasing the probability of errors to occur. They presented two possible solutions to this problem, either the user receives a text message with the information of the selected place or the platform allows the users to directly call the selected place, having the platform has an intermediary which allows the communication to be free of charge for the user.

Routes

The social workers agreed with having the route points in the platform available for consultation but disagreed in presenting a schedule. Arguing that presenting schedules would lead to false expectations by the part of homeless people and generate tension between them and the volunteers, since it is usual for a team of volunteers to stay longer than the expected with a given homeless person, leading to changes in the schedule of that night. We suggested the possible solution of creating an app that when installed on a volunteer's smartphone would give the platform his location and consequently his team location to calculate the distance and time of arrival to the next route point. The social workers answered that some volunteers do not use the technological tools currently available to them and have consequence the social workers cannot confirm or force the volunteers to use the said app but could present it as an available tool and see if it is well received.

Tickets

This functionality was received with acceptance, because currently all requests are made face-to-face with the volunteer, making only possible to satisfy the request on a subsequent round. But with this functionality, the organization would have knowledge of the requests before the start of the rounds and consequently fulfill the requests more quickly. The social workers argued that the current implementation of this function creates expectations about the fulfillment of the requests, which generates problems if the fulfillment is not possible. To diminish this expectation, the social workers suggested sending an automatic message informing that the request is being analyzed after the request creation. The social workers also discussed the implication of having to have someone to analyze, sort, and forward to other services the created requests, suggesting that a web application would facilitate this work.

5.5 Discussion

In an overview, the platform was accepted by most stakeholders participating in the focus groups, has a potentially useful tool in helping homeless people in their daily lives and giving institutions more tools to support the homeless people. Each stakeholder seems to focus and evaluate the platform with a distinct outlook. Social workers focus on their job of helping people abandon homelessness, wanting all features to be connected with the institution and viewing the platform as a vehicle to make the institution and the homeless people closer. On the other hand, we have the homeless people wanting the platform to support all their information and communication needs, to increase their quality of life in the streets. Without ever referencing the institutions or organizations that help people abandoning homelessness as something important and needs for their survival in the streets. The volunteers seem to be the most divided group regarding the platform usefulness and technology aimed at homeless people, as previously seen in the first studies of this dissertation. Some volunteers share the same ideas as social workers regarding the platform and its objectives, but the other half thinks the objective of the platform should be supporting the volunteers and help them coordinate the rounds and in dealing with the homeless people, suggesting a complete refocus of the platform on them. This suggestion implies the apparent need of technology supporting the volunteers and their rounds but talking with the social workers we found the existence of platforms aimed at supporting the volunteers and the refusal of some volunteers to use said platforms, creating tension between the stakeholders. Social workers said that they cannot force the volunteers to use the platforms and thus not existing a full adoption of the technological tools available to increase their quality of work.

Each stakeholder also seems to focus more on the distinct features of the platform. For the homeless people, the location features seem to be the most crucial, because allowing them to obtain information of locations independently without having to ask anyone and this way of keeping their privacy. For the social workers, the most essential feature seems to be the tickets since it allows them to organize better their support to homeless people and consequently making it more efficient. In the case of the volunteers, they seem to show more interest in the contact list feature, since it allows them to communicate remotely with the homeless people they found during their rounds without having to share their private phone number.

The social workers suggested limiting the access to certain features to specific stakeholders' groups, which is the case of the account feature. For some social workers, this feature should only be available to people in the shelter and who started the process of abandoning homelessness. But since the use of the contact list implies that the user is registered, the use of the contact list by the volunteers and the homeless people they found during the rounds will be impossible, making this feature useless.

The interface of the platform was a point of discussion among all stakeholders. Some

volunteers suggested that IVR was not a good interface choice because the regular homeless person would not wait for the audio of both message and dial options to be played, leading to poor and frustrating navigability. To avoid this, other stakeholders suggested the text of both messages and dial options to be simple, short and of clear meaning. While also ensuring that the number of options presented, and the depth of workflows needed to reach a given feature is the minimum possible.

Another problem was the voice synthesis, while during the development and testing the voice was fully understandable due to accessing the platform through a voice over IP software, but when the platform was accessed through the normal telephony network, due to his lessen quality, the sharpness of the voice was also diminished leading to misunderstandings. Due to this, the stakeholders suggested a voice with good diction and easily understandable. A much need feature, presented by both social workers and homeless people, was the interface to be available in other languages, like English, due to the great among homeless foreigners.

Chapter 6

Conclusions

In the studies performed before the development of the IVR system, we were able to characterize the homeless population relationship with technology and their information and communication needs. We found a population where technology use is present through telephony, but that lacks access to important information for the survival and wellbeing of a person living in the streets.

By developing an IVR platform, we guaranteed that information is available to the largest amount of homeless people that uses technology. The platform works as an aggregator of information and services specially directed at the homeless population that can be easily accessed through a simple phone call.

During the prospective evaluation of the prototype, all stakeholders found the system to be useful and to have potential as a fully deployed platform. The social workers found the platform to be a good vehicle for bringing the organizations and the homeless population closer, while the homeless population praises the amount of useful information present in the platform. The system also faced criticism, due to the slow output of information an IVR system provides since all information is presented as audio and due to the complexity of some menus.

6.1 Benefits

Presenting the developed prototype to all stakeholders gave us some insight regarding the feature's usefulness and flaws. For the organizations, institutions and its stakeholders the benefits are the following:

- Better support in helping people abandoning homelessness;
- A more efficient fulfillment of homeless people requests;
- The possibility of supporting homeless people remotely and during the day;
- Ease the process of alerting homeless people of appointments by social workers;

- Easier information sharing with the homeless people with the privacy of the organization worker in mind.

For the homeless people, the benefits are:

- Easy access to information regarding various places for the survival and well-being of a person living in the streets;

- Easy access to information on how to abandon homeless and consequently raising the probability of a person searching for help.

6.2 Limitations

The primary limitation of this dissertation is being restricted to the Portuguese society in which it was developed. The homeless people involved and their necessities are only a representation of this population living in Lisbon, without any possible extrapolation to this stakeholder on other societies or the generalization of homeless people based only on the population involved.

Another significant limitation is the development of this work in collaboration with an organization. All stakeholders who focused on helping homeless people and were involved in the studies, the social workers and the volunteers, belonged to this organization, making this work follow and report its philosophy and work method.

All results and conclusions obtained on this work are based on the focus groups where the prototype was presented. No full and public deployment of the platform was performed, making the results based only on the stakeholder's observation of us using and presenting the platform.

To access the platform the homeless people must use a telephony capable device. Which is proven to be a problem to homeless people, because either they have to buy a device which is difficult for person with no or low income, have to use a public phone cabinet which is rare and defeats the propose of remote access to information or have to ask to use the phone of others which diminishes the privacy of the user.

The IVR interface is also a limitation in many levels. Due to the complexity of the navigability and its slow output, the usability of the platform will be dependent on the person capabilities, technology skills, and patience. Making a possible subset of homeless people unable to use the platform. Another limitation is the type of data stored and presented in this platform, everything has to be speakable and understandable text. Requiring the transformation of certain types of data, since visualization as output is impossible, which may lead to unsuitable and long text descriptions.

Another current limitation is language support since only Portuguese is available, which will lead to foreigner homeless people to be unable to use the platform.

6.3 Future Work

Due to the prospective evaluation focus group with the various stakeholders, we were able to obtain feedback regarding the current features of the platform and envision the necessary changes to the platform and new features.

- **More languages support** was a need both social workers and homeless people expressed since many foreigners homeless roamed the street in Lisbon.
- **Security** must be implemented, since the server application does not have any security at the moment, making it vulnerable if fully deployed.
- **Refining the audio translation** because Google Cloud Speech-to-Text has proven to be inaccurate in Portuguese, leading to a frustrating use of the platform. A possible solution would be trying other speech to text APIs and find the one with the best results.
- **Develop the account feature** to allow the registration and login of the various stakeholders in a useful and secure manner.
- **Ensure optimized navigation** by analyzing the current initial messages and dial options of the workflows and mitigate complexity when found and possible.
- **Refining the types of locations** by removing the least important and keeping or adding the types most focused by the stakeholders.
- **Allow direct calling through the platform**. This was an idea suggested by the social workers when presented with the information of a given place.
- **Allowing text messages** from the platform to the user was also suggested by social workers, in the case of a homeless person wanted to obtain and store information for later use, without having to call the platform.
- **Develop access to the platform through a website and an android app** to facilitate access to the existing information in the platform and its features, as was suggested by the stakeholders.
- **Implement route feature accordingly** to the specification given by the stakeholders. Allowing the users to be alerted when a van is the near the subscribed route point and allowing the volunteers to provide their current location to the system through their smartphones automatically.
- **Evaluate the current IVR menu-based interface and the usefulness of a natural language user interface** in comparison and proceed to changes if good results are found.

- **Perform a full deployment of the platform** and evaluate its use among the stakeholders.

Bibliography

[1] CM-Lisboa. Ii diagnótico social de lisboa, 2017.

[2] Comunidade Vide e Paz & Everis. Relatório de avaliação de impacto social, 2015.

[3] Karin M Eyrich-Garg. Mobile phone technology: a new paradigm for the prevention, treatment, and research of the non-sheltered "street" homeless? *Journal of Urban Health*, 87(3):365–380, 2010.

[4] FEANTSA. Homelessness in portugal, 2017.

[5] Feantsa. Homeless in europe - increases in homelessness, 2018.

[6] Feantsa. Third overview of housing exclusion in europe, 2018.

[7] Konstantinos Kazakos, Siddhartha Asthana, Madeline Balaam, Mona Duggal, Amey Holden, Limalemla Jamir, Nanda Kishore Kannuri, Saurabh Kumar, Amarendar Reddy Manindla, Subhashini Arcot Manikam, et al. A real-time ivr platform for community radio. In *Proceedings of the 2016 CHI Conference on Human Factors in Computing Systems*, pages 343–354. ACM, 2016.

[8] Christopher A. Le Dantec and W. Keith Edwards. Designs on dignity: Perceptions of technology among the homeless. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems*, CHI '08, pages 627–636, New York, NY, USA, 2008. ACM.

[9] Christopher A. Le Dantec, Robert G. Farrell, Jim E. Christensen, Mark Bailey, Jason B. Ellis, Wendy A. Kellogg, and W. Keith Edwards. Publics in practice: Ubiquitous computing at a shelter for homeless mothers. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems*, CHI '11, pages 1687–1696, New York, NY, USA, 2011. ACM.

[10] Nisha Mohan and Abhraneel Sarma. Elevate: Ensuring access to food for homeless populations. In *Proceedings of the 2017 CHI Conference Extended Abstracts on Human Factors in Computing Systems*, CHI EA '17, pages 80–85, New York, NY, USA, 2017. ACM.

[11] Neil Patel, Deepti Chittamuru, Anupam Jain, Paresh Dave, and Tapan S Parikh. Avaaj otalo: a field study of an interactive voice forum for small farmers in rural india. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems*, pages 733–742. ACM, 2010.

[12] Jahmeilah Roberson and Bonnie Nardi. Survival needs and social inclusion: Technology use among the homeless. In *Proceedings of the 2010 ACM Conference on Computer Supported Cooperative Work*, CSCW '10, pages 445–448, New York, NY, USA, 2010. ACM.

[13] Reem Talhouk, Tom Bartindale, Kyle Montague, Sandra Mesmar, Chaza Akik, A Ghassani, M Najem, H Ghattas, Patrick Olivier, and Madeline Balaam. Implications of synchronous ivr radio on syrian refugee health and community dynamics. In *Proceedings of the 8th International Conference on Communities and Technologies*, pages 193–202. ACM, 2017.

[14] Sanna J Thompson, Holly McManus, Janet Lantry, Liliane Windsor, and Patrick Flynn. Insights from the street: Perceptions of services and providers by homeless young adults. *Evaluation and program planning*, 29(1):34–43, 2006.

[15] Aditya Vashistha, Edward Cutrell, Gaetano Borriello, and William Thies. Sangeet swara: A community-moderated voice forum in rural india. In *Proceedings of the 33rd Annual ACM Conference on Human Factors in Computing Systems*, pages 417–426. ACM, 2015.

[16] Jill Palzkill Woelfer and David G Hendry. Homeless young people's experiences with information systems: life and work in a community technology center. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems*, pages 1291–1300. ACM, 2010.

[17] Jill Palzkill Woelfer and David G Hendry. Homeless young people and living with personal digital artifacts. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems*, pages 1697–1706. ACM, 2011.

[18] Deepika Yadav, Pushpendra Singh, Kyle Montague, Vijay Kumar, Deepak Sood, Madeline Balaam, Drishti Sharma, Mona Duggal, Tom Bartindale, Delvin Varghese, et al. Sangoshthi: Empowering community health workers through peer learning in rural india. In *Proceedings of the 26th International Conference on World Wide Web*, pages 499–508. International World Wide Web Conferences Steering Committee, 2017.

Appendix A

Documents for the Ethic Commission

Ciências ULisboa | Comissão de Ética para a Recolha e Protecção de Dados de Ciências

Section 1. Applicant

Name of Researcher (Applicant):	Tiago Guerreiro
Institution (if different from FCUL, FCiências.ID):	FCUL
Email address:	tjvg@di.fc.ul.pt
Contact Address:	Departamento de Informática, FCUL, 6.3.36
Telephone Number:	217500566
Research Unit:	LaSIGE
CENSUS number / Student number:	F41555

Section 2. Project

Project / Study Title (public):	Understanding Technology Usage, Information and Communication Needs of Homeless People
Supervisor (if applicant is a student):	Tiago Guerreiro
Funding: Submitted to (for funding, if applicable):	Externally Funded ☐ Internally Funded ☒ Click here to enter text.

Section 3. Type of Project

Questionnaire/Survey e.g. surveys of members of particular groups / organizations; mail out questionnaires, street surveys	☒
Experiments e.g. participants completing tasks under controlled conditions, use of tasks/method other than or in addition to questionnaires/surveys	☐
Observational e.g. observing how people behave in a natural setting or in a laboratory	☐
Data-based e.g. the use of official statistics where individuals could be identified	☐
Other	☐

Ciências ULisboa | Comissão de Ética para a Recolha e Protecção de Dados de Ciências

If 'Other', please describe.	Click here to enter text.

Section 4. Project Details

Proposed date on which the project/study will begin *(assuming, if applicable, that funding has already been granted by a funding agency)*:	01-12-2017
Proposed date on which the project/study will end:	31-01-2018

4.1 - Project Outline & Aims

Briefly describe:

- The aims of this research
- The main tasks (or tests) that participants will be required to complete
- What use will be made of sensitive economic, social or personal data.

This description must be in everyday language, free from jargon, technical terms or discipline-specific phrases.
(No more than 300 words)

This study is part of a research project in course with the objective of improving the obtainment and propagation of information among individuals in a homeless situation. The investigation team is composed by researchers from Faculty of Sciences and Instituto Superior Técnico, both from the University of Lisbon. The current objective of the project is developing technologies that will enable individuals that want to leave homelessness to obtain crucial information to their survival through asynchronous communication. In this study, we aim at gathering data regarding the relationship between individuals in process of abandoning homelessness, technology and information. Mainly, we aim to know what are the current communication and information access practices of the homeless, what kind of technologies do they use and how, what are their current information and communication needs, and how can they be supported by technology. We will gather this data from volunteers at Comunidade Vida e Paz and directly from the individuals that started the process of abandoning homelessness in Espaço Aberto ao Diálogo, a space managed by that social organization.

4.2 - Proposed Research Methods

Please provide an outline of the proposal research methods, in layman's terms, avoiding using jargon and technical terms as much as possible. Do include:

- Where and how data will be collected and stored;
- All tasks that participants will be asked to complete;
- If the research will take place outside of Portugal or in collaboration with internationally-based partners, and/or if research will take place using the Internet;
- Present an outline of the method in a step-by-step chronological order.

(No more than 700 words)

We propose gathering data in three possible distinct ways from two distinct populations. This study is divided in three phases. We will start by approaching the volunteers at Comunidade Vida e Paz. These volunteers work in groups during their rounds while doing food distribution, so depending on the volunteer's availability we may either do personal interviews with the available volunteers, if most of the group members aren't available, or otherwise conduct a focus group. During this phase, we aim to obtain information regarding the association relationship with technology, but also collect data about the

homeless technologic, communication and information needs and practices through the volunteers. The audio of the interviews/focus groups will be recorded for later transcription and coding. After finishing this phase, we aim to deploy an online anonymous closed-answer questionnaire to the maximum number of volunteers possible, to obtain more concrete and numeric data, allowing a better understanding of the domain. In the final phase, we aim at approaching individuals in homelessness that already have started their process of reintegration in Espaço Aberto ao Diálogo. The objective of this space is proving help in the first steps of abandoning homelessness. There we aim to do focus groups with the attending homeless and technicians. Those focus groups will be guided by a card sorting activity, where we will ask the participants to choose and order by importance the cards, allowing them to create and remove cards at will. The cards will approach themes like what technological devices do they use, ways of communication and information propagation and daily activities regarding information and communication. During this activity, we will deepen our knowledge by questioning the participants about their choices of cards. In these focus groups, we will record the chosen cards and their order. This exercise will allow to prioritize practices and needs so future technologies can take those in consideration. The audio will also be recorded for later transcription and thematic analysis.

Section 5. Participant Details

Does this research specifically target (select all that apply):

Students or staff of this institution	☐
Adults (over the age of 18 years and competent to give consent)	☒
Children/legal minors (anyone under the age of 18 years)	☐
The elderly	☐
People with intellectual or communication difficulties	☒
People in custody	☐
People engaged in illegal activities (e.g., drug-taking)	☒

Number of participants:	4 teams of Volunteers, each with approximately 6 members, in the interviews/focus group stage. 10 to 15 individuals in a homeless situation for the card sorting focus groups. 150 Volunteers through online questionnaires
Age from:	18
Age to:	75

Ciências ULisboa | Comissão de Ética para a Recolha e Protecção de Dados de Ciências

Target populations to recruit participants, and means to select participants:	We want to target Volunteers teams/individuals that currently volunteer in the association, that are interested and available to participate in the study. These participants have extensive knowledge about the needs of people in a homeless situation and have accompanied several in the process of leaving the streets. This knowledge is highly relevant for us to consider when designing new technologies that useful and usable. We also want to target homeless individuals that currently attend Espaço Aberto ao Dialogo, that currently want to abandon homelessness and that are interested in participating in the study. While the majority of the population attending this space is free of drus and does not present a diagnosed mental illness, given the high prevalence of these issues in this population, it is not guaranteed that our sample does not include people in those conditions. However, all the interaction will be mediate by technicians that interact daily with them which minimizes the possible hurdles for both parties.
Reasons to select the required populations:	These populations are required because they hold the knowledge regarding the current communication and information access practices, the kind of technologies used and the current information and communication needs.

Does this project require approval from an external authority (e.g., CNPD, schools, governing body)?	**YES** ☐	**NO** ☒
Has approval already been granted?	**YES** ☐	**NO** ☒

Section 6. Participant Information

	YES	**NO**
Will you inform participants that their participation is ***voluntary***?	☒	☐
Will you inform participants that they may ***withdraw*** from the research at any time and for any reason?	☒	☐
Will you inform participants that their data will be treated with full ***confidentiality*** and that, if published, it will not be identifiable as theirs?	☒	☐
Will you provide an ***information sheet*** that will include the contact details of the researcher/team?	☒	☐
Will you obtain ***written consent*** for participation?	☒	☐
Will you debrief participants at the end of their participation (i.e., give them an explanation of the study and its aims and hypotheses)?	☒	☐

Ciências ULisboa | Comissão de Ética para a Recolha e Protecção de Dados de Ciências

Will you provide participants with ***written debriefing*** (i.e., a sheet that they can keep that shows your contact details and explanations of the study)?	☒	☐
If using a ***questionnaire***, will you give participants the option of omitting questions that they do not want to answer?	☒	☐
If an ***experiment***, will you describe the main experimental procedures to participants in advance, so that they are informed about what to expect?	☒	☐
If the research is ***observational***, will you ask participants for their consent to being observed?	☒	☐

Section 7. Participant Consent

Please describe the arrangements you are making to inform participants, before providing consent, of what is involved in participating in your study:

To inform participants, we will create an information leaflet that will be given and read to each participant before each interview/focus group. The information leaflet has information about the study scope, the advantages and risk of participating and objectives. This information leaflet is attached to this submission.

Please describe the arrangements you are making for participants to provide their full consent before data collection begins. Note that you can adapt, minimally, the template of the "*Formulário de Consentimento Informado*", to take into account the specificities of your studies:

Before the start of an interview/ focus group/ survey a written document with the various consent clauses will be provided to each participant. In this document the participant may choose which clauses he agrees with and optionally agree to receive the final report. The participant is free to disagree with the clauses and abandon the study at any time. We resorted to the template provided by the commission and will use it consistently with all participants. In the specific case of homeless people, consent will be requested with the presence of the association's psychologist, member of the technical team that will be present in all sessions. If the psychologist identifies that the person is not able to take an informed decision on participation, the participant will not partake in the study and will be debriefed together with the psychologist. Also, beforehand, only homeless people that are eligigle to participate, i.e., do not present a mental health condition that can jeopardize decision-making, are to be recruited; once again, this screening will be done together with the association's team, particularly the psychologist.

Participants should be able to provide written consent. If you think gaining consent in this way is inappropriate for your project, then please explain how consent will be obtained and recorded.

Section 8. Participant Debriefing

Please describe the debriefing that participants will receive following the study and the exact point at which they will receive the debriefing:

The participants will receive the debriefing after each interview/focus group. This debriefing will consist in checking if the participants have any remaining doubt or insecurity about the study and their participation and ensure that they are solved. And also thank them for participating in the study. This process is accompanied by technicians of Comunidade Vida e Paz.

It is a researcher's obligation to ensure that all participants are fully informed of the aims and methodology of the project, and to ensure that participants do not experience any levels of stress, discomfort, or unease

following a research session. Also describe any particular provisions or debriefing procedures that will be in place to ensure participants feel respected and appreciated after they leave the study. Please attach the written debriefing sheet that you will give to participants. If you do not plan to provide a written debriefing sheet, please explain why.

Section 9. Protection of personal data of participants

Describe, in some detail, the types of personal data that will be requested to participants and how this data is going to be organized, protected, shared, and eventually backed-up. In particular, describe the anonymity procedures of the responsibility of the principal investigator ensuring that the members of the research team have no access to personal data which is irrelevant for research purposes. Address the use of internet or public / private information systems throughout the research.
(No more than 300 words)

The only personal data that we will gather will be age range and gender during surveys to the volunteers. The information will be confidentially handled to prevent subject names or other directly identifiable information appear on any reports and publications. The data will be introduced by the investigator on a database to perform statistical analysis. Essential documents will be archived in a way that ensures that they are readily available, upon request, to the competent authorities. Case Report Form will be used as source documents for collecting data. All paper copies will be stored in a locked file as well as all electronic data. Data will be maintained for 15 years in a restricted access locked file cabinet. After that, they will be destroyed. All data will be confidentially locked and all subject information will remain anonymous.

Section 10. Risk Considerations

10.1 - Potential risk to participants and risk management procedures

Identify, as far as possible, all potential risks (small and large) to participants (e.g. physical, psychological, etc.) that are associated with the proposed research. Please explain any risk management procedures that will be put in place and attach any risk assessments or other supporting documents.

There are no expected adverse events nor safety issues to the participants. Nonetheless, any unexpected event will be reported. At any time during this study, participants will be able to withdrawal from it, without facing any consequences.

10.2 - Potential risk to researchers and risk management procedures

What are the potential risks to researchers themselves? For example, personal safety issues such as lone or out of normal hours working or visiting participants in their homes; travel arrangements, including overseas travel; and working in unfamiliar environments. Please explain any risk management procedures that will be put in place and attach any risk assessments or other supporting documents.

There are no expected adverse events nor safety issues to the researchers. Nonetheless, any unexpected event will be reported. When approaching the homeless individuals, during the focus group in the Espaço Aberto ao Diálogo, there will always be at least one technician present.

Section 11. Identification joint activities with the members of the Commission

Ciências ULisboa | Comissão de Ética para a Recolha e Protecção de Dados de Ciências

Did you participate in common research projects or did you co-authored scientific papers with any of the members of the Comissão de Ética para a Recolha e Protecção de Dados Pessoais (See Composição da Comissão) in the last 24 months?

Tiago Guerreiro is a Commission member.

Section 12. Summary of critical issues

If all the answers are NO, the Commission will follow a fast evaluation procedure.

		YES	NO
1	The project involves children or other vulnerable groups?	☒	☐
2	The project requires the co-operation of a gatekeeper (defined as someone who can exert undue influence) for initial access to the groups or individuals to be recruited?	☒	☐
3	Is it necessary for participants to take part in the project without their knowledge and consent e.g. covert observation of people in non-public places?	☐	☒
4	The project includes deliberately misleading participants in any way?	☐	☒
5	The project includes discussion of sensitive topics e.g. sexual activity or drug use?	☐	☒
6	The project may cause psychological stress, anxiety, harm or negative consequences, beyond that encountered in normal life?	☐	☒
7	The project requires prolonged or repetitive testing i.e. more than 4 hours commitment or attendance on more than two occasions?	☐	☒
8	Are there financial inducements due to participants (other than reasonable expenses and compensation for time)?	☐	☒
9	The project causes pain or more than mild discomfort?	☐	☒
10	The project collects and stores personal or sensitive data from participants?	☐	☒
11	The project plans to transfer participants' personal or sensitive data to other institutions somehow participating in the studies?	☐	☒
12	???	☐	☐
13	???	☐	☐

Ciências ULisboa | Comissão de Ética para a Recolha e Protecção de Dados de Ciências

14	???	☐	☐

Section 13. Public information

Describe the study and the populations associated to it, for public release in the site of the Commission, enabling others to contact you in case of similar activities.
(No more than 100 words)

The aim of this study is to inform the design of novel technologies that facilitate the communication and information propagation among homeless people. We aim to collect data regarding the kind of technologies that are used and how, the current information and communication needs and access practices of the homeless, and how can they be supported by technology. We will gather this data from the volunteers working at Comunidade Vida e Paz through interviews, and directly from individuals in the process of abandoning homelessness with focus groups at Espaço Aberto ao Diálogo, a space of the same institution.

Section 14. Declaration

I certify that the information contained in this application is accurate. I have attempted to identify the risks that may arise in conducting this research and acknowledge my obligations and the rights of the participants.	
Name of Principal Investigator:	Tiago Guerreiro
Signature:	
Date	15/11/2017

For office use only:

CERPD has considered the ethical aspects of this proposal. The committee recommends that the study/project be:

☐ Approved, without conditions
☐ Approved, with conditions (identified below)
☐ Major revision required, leading to resubmission (for reasons below)
☐ Not approved (for reasons below)

Click here to enter text.

Research Protocol

Understanding technology usage, information and communication needs of homeless people

Principal Investigator

Tiago Guerreiro, PhD
LaSIGE
Faculdade de Ciências da Universidade de Lisboa Campo Grande,
Edifício C6, Piso 3, Sala 6.3.36
1749-016 Lisboa
tjvg@di.fc.ul.pt

Researchers and Institutions

The research team is composed of:

- Tiago Guerreiro, PhD, Principal Investigator
- Hugo Nicolau, PhD
- André Rodrigues, PhD
- Luís Carvalho, MSc

Involved institutions are:

- LaSIGE, DI, Faculdade de Ciências da Universidade de Lisboa
- Associação Comunidade Vida e Paz

Version number and Date

November 2017, Version 1.0

Study Period

2 months. Expected data of first enrolment: 1st December 2017.

Background and Rationale

Nowadays, accessing information and communicating is becoming easier due to new, better and more reasonably priced technologies. The homeless community is no exception, and is starting to adopt digital devices in their everyday life, either by using their own devices or by recurring to technologies provided by public services, like libraries and shelters [3, 4]. Although access to digital devices can be easy, access to needed information can be a challenging task, since most information is either obtained mouth-to-mouth among the homeless community or by talking with volunteers in person [2]. This difficulty in obtaining information is especially visible in the first weeks of homelessness, when the person doesn't know anyone living in the streets or services essential to his or her survival. And thus, making life harder and hinder the process of abandoning homelessness. This reveals other problem, which is information persistence among the homeless [1]. Due to the, sometimes temporary, nature of homelessness, essential information is always getting lost, since there is no way of propagating street knowledge from

individuals who abandon homelessness to the new homeless people [2]. On the other hand, previous studies have also showed that the homeless community suffers from information overload, due to the large amount of information services providers share about their programs. Meaning that for some individuals this information isn't essential to their survival and therefore useless [1].

Research Goals

The primary goal of this study is to find the information and the communication needs of the homeless, either in their community or with the associations. Particularly, we want to address the following research questions:

1. What are the current communication and information access practices of homeless people? What kind of technologies are used and how?
2. What are the current information and communication needs of the homeless? How can they be supported by technology?

Methodology

Study Design and Duration

A qualitative formative 8-week non-controlled study will be performed.

Participant Selection

A total of 4 volunteer street teams, each with approximately 6 individuals from *Comunidade Vida e Paz*. A number of 10 to 15 homeless people that attend *Espaço Aberto ao Diálogo.*

Participant inclusion criteria

- Volunteers
  - Currently volunteering in the association
  - Being interested in participating in the study
  - With availability to participate in the study
- Homeless
  - Being interested in participating in the study
  - Currently wanting to abandon homelessness
  - With no visible nor reported current drug addiction or mental health problems

Participant exclusion criteria

- Volunteers
  - No exclusion criteria
- Homeless
  - Living a homeless lifestyle by choice
  - Not wanting to abandon homelessness
  - Drug addiction
  - Visible mental health problems

Procedure

Volunteer groups at *Comunidade Vida e Paz* with availability will be invited to participate in the study. We will use a sample of 4 teams of Volunteers each with approximately 6 members.

Homeless people that attend the *Espaço Aberto ao Diálogo* and that fulfill the inclusion criteria will also be invited to participate in the study. We will use a sample of 10 to 15 individuals. The study is divided in 3 phases:

Focus Group with Volunteers Teams and/or Semi-Structured Interviews with each Volunteer (Phase 1): If full or partial teams are available to participate in the study then we will discuss with each team separately. Otherwise, we will conduct semi-structured interviews with each individual member. In this phase, we aim to know about the current communication flow among volunteers and with the homeless, the homeless current information needs, the technology used among the homeless and in the association. A sample of questions on the focus group interview to the teams or the volunteers include:

- What type of technology do you see homeless people using daily? To what end?
- Do you keep in touch the homeless after volunteering? How?
- What type of information do you think is most useful for the homeless?
- What information do you gather during the night rounds? How is it used?

Questionnaires with Volunteers (Phase 2):

Deploy anonymous closed-answer questionnaires to the maximum number of Volunteers possible, to obtain more concrete and numeric data allowing a better understanding of the domain.

Focus Group with Homeless and Technicians (Phase 3):

At *Espaço Aberto ao Diálogo* perform focus groups with the homeless, where we will collect data directly from our target population through a discussion of topics. The topics to be discussed are: what type of technology do the homeless use/own, from what end, how do the homeless access information and what type of information. To help finding preferences amount the individuals regarding information and technologies, a card sorting experience will also be performed, where the participants will be asked to sort needs by relevance. A sample of questions on the focus group are:

- What type of information in more valuable to you?
- What type of technologies do you use?
- How do you obtain information?

Expected Result & Limitations

The results of this study will give us a better understanding of communication practices and information needs of the homeless that want to abandon homelessness.

Safety Issues and Adverse Events Reporting

A possible adverse event is the inability of obtaining direct input of the homeless during the focus group because of the lack of participation. In terms of safety issues none are expected, but nonetheless any unexpected event will be reported.

Withdrawal of Subjects

At any time of the research study, subjects will be able to withdrawal from it. The withdrawal of subjects will a direct impact in the study results, because will reduce the size of the sample if no

replacements are found. Thus, decreasing data reliability and creating a non-representative data set.

Data Analysis

Qualitative data, semi-structured interviews and focus groups, will be subject to thematic analysis. Interviews will be transcribed and coded by two independent coders, resorting to qualitative data analysis software (e.g., RQDA). Inter-rater reliability will be reported (Cohen's kappa). Statistical analysis will be performed using SPSS 21. Descriptive statistics will be provided for all quantitative data, particularly to what respects session and usage data.

Data Handling and Record Keeping

The information will be confidentially handled to prevent subject names or other directly identifiable information appear on any reports and publications. The data will be introduced by the investigator on a database to perform statistical analysis. Essential documents will be archived in a way that ensures that they are readily available, upon request, to the competent authorities. Case Report Form will be used as source documents for collecting data. All paper copies will be stored in a locked file as well as all electronic data. Data will be maintained for 15 years in a restricted access locked file cabinet. After that, they will be destroyed. All data will be confidentially locked and all subject information will remain anonymous.

Ethics

Ethics Committee Approval

The study protocol will be submitted to the Ethics Committee of the Faculty of Sciences of The University of Lisbon for approval of the experimental protocol and corresponding informed consent form.

Informed Consent

The Investigator will ensure that an appropriate informed consent process is in place to certify that potential participants and the legal representative are fully informed about the nature and objectives of the study, the potential risks and benefits of study participation, and their rights as research subjects. The general procedures of the study will also be presented to them and at the end, they will have the opportunity to ask for more information and clarify any hesitations. The Investigator will obtain the written, signed informed consent from each subject, prior to performing any study procedures. The date and time subject, or the subject's legal representative signs the informed consent form and a narrative of the issues discussed will be documented in the subject's case report form. The Investigator will retain the original signed informed consent form, and a copy will be provided to the subject, or to the subject's legal representative. The retrained form will be stored at a separate folder in the bureau of the principal investigator. The investigator will ensure that ongoing questions and concerns of enrolled subjects will be adequately addressed and subjects will be informed of any new information that may affect their decision to continue participating in the research study. In case of substantial changes to the study, the investigator will ask the subject for a new consent to continue participating in the study. It will be emphasized that the participant is at liberty to withdraw their consent to participate at any time, without penalty or loss of benefits to which the participant is otherwise entitled. Participants who refuse to give, or withdraw, written informed consent will not be included or continued in this study, but this will not impact on their subsequent care.

References

1. Le Dantec, Christopher A., and W. Keith Edwards. "Designs on dignity: perceptions of technology among the homeless." Proceedings of the SIGCHI conference on human factors in computing systems. ACM, 2008.
2. Strohmayer, Angelika, Rob Comber, and Madeline Balaam. "Exploring Learning Ecologies among People Experiencing Homelessness." Proceedings of the 33rd Annual ACM Conference on Human Factors in Computing Systems. ACM, 2015.
3. Reitzes, Donald C., et al. "Digital communications among homeless people: Anomaly or necessity?." Journal of Urban Affairs 39.2 (2017): 145-159.
4. Eyrich-Garg, Karin M. "Mobile phone technology: a new paradigm for the prevention, treatment, and research of the non-sheltered “street” homeless?." Journal of Urban Health 87.3 (2010): 365-380.

Ciências ULisboa | Comissão de Ética para a Recolha e Protecção de Dados de Ciências

Folheto Informativo

PROJECTO: Perceber os usos da tecnologia e as necessidades de informação e comunicação em indivíduos em situação de sem-abrigo

INVESTIGADOR RESPONSÁVEL: Tiago Guerreiro

Vimos desta forma convidá-la/o a participar no nosso estudo de investigação focado em perceber o uso de tecnologia e as necessidades de informação e comunicação de indivíduos na situação de sem-abrigo. Antes de decidir, gostaríamos de lhe apresentar os detalhes desta investigação, a sua razão de ser, a sua utilidade potencial e as implicações da sua participação. Um membro da equipa da investigação irá acompanhá-lo na leitura deste folheto e responderá a quaisquer perguntas que queira fazer.

1 - Em que consiste o estudo "Perceber o usos da tenologia e as necessidades de informação e comunicação em indivíduos em situação de sem-abrigo"?

Este estudo insere-se num projeto de investigação em curso que tem como objetivo melhorar a obtenção e propagação de informação assim como comunicação entre indivíduos em situação de sem-abrigo, com suporte a tecnologias digitais. A equipa de investigação é composta por Investigadores da Faculdade de Ciências da Universidade de Lisboa e do Instituto Superior Técnico.

O objetivo do presente trabalho é desenvolver tecnologias que permitam a indivíduos que estão no processo de abandono da situação de sem-abrigo obterem informação crucial para a sua sobrevivência de forma fácil. Neste estudo procuramos obter conhecimento sobre o relacionamento entre os sem-abrigo, tecnologia e informação. Principalmente, procuramos saber que tipos de tecnologia são usados e para que fins, quais são as praticas de acesso a comunicação e informação, e quais são as atuais necessidades de informação e comunicação do sem-abrigo e como podem ser suportadas recorrendo a tecnologia.

2 - Tenho de participar neste estudo?

A participação no estudo é totalmente voluntária. Vamos descrever o estudo e apresentar o conteúdo deste folheto informativo, incluindo os detalhes da sua participação. Se concordar em participar, irá assinar um Formulário de Consentimento. Serão-lhe fornecidas cópias deste documento e do Formulário de Consentimento informado.

3 - E se eu desejar desistir do estudo?

É livre de desistir, em qualquer altura, sem ter que fornecer quaisquer razões ou explicações.

4 - O que terei de fazer no âmbito do estudo?

No âmbito do estudo, se for um voluntario irá participar numa sessão de entrevistas individuais, se a maioria do grupo de voluntario a que pertence não estiver disponível. Caso contrario irá participar numa sessão de grupo de foco, no qual iremos abordas as mesmas questões da entrevista só que em grupo de forma fomentar a discussão e partilha de ideias.

Se for um utente do Espaço Aberto ao Dialogo, irá participar numa sessão de grupo de foco, onde iremos ouvir a opinião de todos os participantes de forma a recolher informação importante para o estudo. Nesta sessão o grupo de foco será guiado por cartões que contêm temas e que dos quais terão de escolher o que são mais importantes.

Cada sessão demorará um tempo máximo de 1 hora, mas não tem um tempo mínimo obrigatório.

Ciências ULisboa | Comissão de Ética para a Recolha e Protecção de Dados de Ciências

Folheto Informativo

O objetivo da investigação é recolher informação relativas às praticas correntes de comunicação e informação entre os sem-abrigo. Não tem como objetivo avaliá-la/o a si. Todas as recomendações e melhorias sugeridas permitirão fazer evoluir a investigação e são bem-vindas.

5 - Quais as desvantagens e riscos de participar?

Não estão previstos quaisquer riscos associados e a expectativa da equipa de investigação é de que as sessões em que participar sejam uma experiência agradável para os participantes.

O horário das sessões será marcado em articulação entre você, a permissão da Comunidade Vida e Paz e os investigadores.

6 - Quais os possíveis benefícios de participar?

De acordo com a nossa experiência, as pessoas gostam de participar em estudos que promovem a comunicação com cientistas. O seu envolvimento irá ajudar a nos a perceber melhor a relação entre os indivíduos em situação de sem-abrigo e a tecnologia. E ajudar ao desenvolvimento de novas tecnologias que permitam uma comunicação e propagação de informação mais fácil entre os sem-abrigo.

7 - O que acontece quando o estudo terminar?

A análise dos dados terminará em Dezembro de 2017. Os resultados do estudo serão publicados em conferências e revistas académicas. Se desejar saber detalhes sobre os resultados e implicações do estudo, fazer-lhe-emos chegar uma cópia do relatório do estudo, mas não antes de Junho de 2018.

8 - E se ocorrer algum problema?

Se tiver alguma preocupação sobre qualquer aspecto deste estudo, deve falar com o investigador responsável, Prof. Tiago Guerreiro, que fará o seu melhor para o elucidar e responder às suas dúvidas, por telefone, 217500566 ou e-mail, tjguerreiro@ciencias.ulisboa.pt]. Caso esteja descontente ou queira apresentar uma queixa formal, pode fazê-lo contactando o Diretor da Faculdade de Ciências da Universidade de Lisboa [e-mail: direccao@fc.ul.pt].

9 - A minha informação será mantida confidencial?

Sim. Seguiremos todas as práticas éticas e legais e toda a informação sobre si será tratada de forma absolutamente confidencial. Para garantir a anonimidade, os registos pessoais estarão apenas disponíveis na sua integralidade, para o investigador responsável, e os membros da equipa de investigação apenas terão acesso aos dados que necessitarem de conhecer. Se os seus dados forem usados para publicações ou apresentações, serão totalmente anonimizados, sem qualquer referência, directa ou indirecta, à sua identidade. Se forem tiradas fotografias, e for nossa intenção usá-las em alguma apresentação, será-lhe pedida autorização prévia. Se estiver disponível para que usemos fotografias ou vídeos para esse propósito, pedir-lhe-emos primeiro que assine autorizações específicas com esse objectivo.

10 - O estudo passou por um processo de revisão?

Sim. Com efeito, este estudo foi revisto pela Comissão de Ética para a Recolha e Protecção de Dados de Ciências (https://ciencias.ulisboa.pt/pt/prote%C3%A7%C3%A3o-de-dados). Esta comissão analisou a proposta de estudo, bem como todos os seus materiais e não levantou objeções do ponto de vista ético.

11 - Quem posso contactar relacionado com este estudo?

Ciências ULisboa | Comissão de Ética para a Recolha e Protecção de Dados de Ciências

Folheto Informativo

Prof. Tiago Guerreiro
Faculdade de Ciências da
Universidade de Lisboa
tjvg@ciencias.ulisboa.pt
217500566

Sinta-se à vontade para os contactar em qualquer matéria relacionada com este estudo.

Muito Obrigado.

Obrigado por nos ter dedicado este seu tempo e por considerar participar neste estudo.

O Investigador Responsável

****

Ciências ULisboa | Comissão de Ética para a Recolha e Protecção de Dados de Ciências

Formulário de Consentimento Informado

PROJECTO: Perceber os usos da tecnologia e as necessidades de informação e comunicação em indivíduos em situação de sem-abrigo

INVESTIGADOR RESPONSÁVEL: Tiago Guerriero

Agradecemos o seu interesse e colaboração neste estudo.
Por favor, preencha o formulário que se segue. Receberá uma cópia quando sair.

1. Confirmo que li e compreendi o folheto informativo associado ao projecto. ☐
2. Foi-me dada a oportunidade de ler e considerar a informação apresentada, e fazer perguntas, as quais foram respondidas de forma satisfatória. ☐
3. Compreendo que a minha participação é voluntária e que sou livre de desistir do estudo em qualquer altura, sem ter que dar quaisquer explicações e sem quaisquer consequências. ☐
4. Compreendo que os dados recolhidos durante o estudo possam ser do conhecimento dos membros da equipa de investigação, sempre que necessário para o estudo. Autorizo que os membros da equipa tenham acesso a esses dados. ☐
5. Compreendo que, caso esta investigação venha a ser publicada, todos os dados serão mantidos anónimos e nenhuma informação será identificável como sendo minha. ☐
6. Gostaria que me fosse enviado o relatório final do estudo. ☐

   O meu endereço de e-mail é: _____
7. Gostaria de ser contactado para o endereço acima acerca de sessões ou estudos adicionais relacionados com este estudo. ☐
8. Declaro que não comuniquei nenhuma razão potencial de qualquer natureza que constitua um eventual factor de risco para a minha saúde ou integridade física. ☐
9. Declaro que participo neste estudo sem qualquer remuneração ou contrapartida, para além do ressarcimento das despesas em que tiver incorrido. ☐
10. **Declaro que tomo a minha decisão de forma inteiramente livre.** ☐
11. **Concordo em participar neste estudo.** ☐

_____ ___/___/___
Nome do Participante Assinatura Data

Sou da opinião que o participante compreendeu os aspectos relevantes da informação fornecida e está apto a tomar uma decisão informada.

_____ ___/___/___
Assinatura do Investigador Responsável Data

Appendix B

Volunteers Interview and Homeless People Focus Group Script

Ciências ULisboa

Volunteers Interview Script

Supporting homeless people with IVR systems

Volunteers Interview/Focus Group

Interview Script & Recommendations

1. Start by thanking (again) the volunteers for participating in the study.
    a. "Boa tarde. Obrigado mais uma vez por participar neste estudo. O objetivo de hoje é falarmos um pouco sobre como e através de que meios comunicam os sem-abrigo, assim como qual a informação necessária à sua sobrevivência e qual o seu impacto no abandono da vida de sem-abrigo. Podemos começar? "
2. Perform a 30-minute (max) interview about current practices and limitations of the homeless and the volunteers.
    a. See seed questions below;
    b. Use them to start a topic but delve deeper when the participants have something more to say;
    c. Don't make questions that have already been answered by the participants;
    d. When the answers are not satisfactory in detail, find alternative questions, to find information;
    e. Make the participant talk, not you.
    f. Don't be afraid of silences. Silences are good; they make the participant think and delve deeper. Don't rush.

Interview Seed Questions

- Há quanto tempo faz voluntariado? Porque que razão?
- Quais as razões para as pessoas se tornarem sem-abrigo?
- Quais as razões para as pessoas não abandonarem a vida de sem-abrigo?
- Quais as razões para as pessoas abandonarem a vida de sem-abrigo?
- Descreva o processo de reintegração na sociedade de um individuo que esteja a abandonar a vida de sem-abrigo.
    - Qual o nível de sucesso do processo? Porquê?
    - Possíveis melhorias? Porquê?
- Que tipo de tecnologias veem os sem-abrigo usar diariamente?
    - Qual a mais prevalente entre os sem-abrigo?
- Como acedem os sem-abrigo a essas tecnologias? (Se dispositivos seus ou de outros)
    - Se seus, como os obtêm?
- Os sem-abrigo usam a Internet?
    - Se sim, que serviços web usam? (ex. e-mail, social networking…)
    - Para que fim?
- Que serviços/espaços dispõem de tecnologias que podem ser usados pelos sem-abrigos? (ex. bibliotecas)
- Quais as atividades que os sem-abrigo realizam recorrendo a tecnologias?
- Como poderia a tecnologia ajudar o processo de reintegração dos sem-abrigo?
- Existem sem-abrigo que não usam tecnologia? Porque?
- Qual a informação necessária para a sobreviver na rua enquanto sem-abrigo?

Ciências ULisboa

Volunteers Interview Script

- Como é obtida essa informação?
- Qual o papel corrente da tecnologia na obtenção de informação por parte dos sem-abrigo?
- Mantêm contacto com algum sem-abrigo após as voltas?
    - Se sim, como mantêm contacto com o mesmo e porque razão o faz?
- Que tipo de tecnologias usam na associação? Para que fim?
    - Satisfaz as vossas necessidades? Porquê?

Thank the participants!

Ciências ULisboa

Focus Group with the Homeless and the Technicians

Focus Group with the Homeless and the Technicians

Focus Group Cards & Recommendations

1. Start by introducing yourself:
    a. "Boa tarde. Eu sou [nome do moderador] e estou aqui para moderar este debate. Estou a desenvolver um estudo na Faculdade de Ciências da Universidade de Lisboa. A minha função aqui é criar uma conversa em grupo que cubra um número de tópicos importantes nos quais eu gostaria do vosso input. "

2. Thank the participants and explain clearly what's the focus group purpose:
    a. "Primeiro que tudo, gostaria de agradecer a todos que decidiram participar e vir aqui expor as suas ideias. O objetivo é ouvir as vossas ideias relativas as necessidades de informação e uso de tecnologias por parte de indivíduos na situação de sem-abrigo. "
    b. "Em particular, estamos interessados na forma como obtêm informação, qual a informação essencial para a sobrevivência na rua assim como quais as dificuldades encontradas em obter informação. Estamos também interessados em saber quais as tecnologias que usam e qual o seu impacto nas vossas vidas."

3. Explain why them, that this is strictly voluntary, that confidentiality is assured and how the data from the discussion will be obtained:
    a. "É importante esclarecer que são vocês que têm conhecimento sobre esta área e que nós estamos aqui para aprender de vocês. Não existem respostas erradas, apenas pontos de vista diferentes. Fiquem à vontade para partilhar os vossos pontos de vistas mesmo que difiram do que outros disseram."
    b. "É de reforçar também que participar nesta discussão é estritamente voluntario. Ou seja, se alguém sentir que está a ser obrigado a estar aqui e quiser desistir é livre de o fazer, sem quais quer consequências. "
    c. "Durante esta sessão usaremos os vossos primeiros nomes, mas nenhum nome será usado nos relatórios. Assegurando assim completa confidencialidade."
    d. "O áudio desta sessão vai ser gravado porque não queremos perder nenhuma das vossas ideias. Normalmente as pessoas dizem coisas úteis nestas discussões e nós não conseguimos escrever depressa o suficiente para obter tudo o que foi dito, portanto iremos gravar o áudio."

4. Explain how the focus group in going to go:
    a. "Com o objetivo de facilitar a troca de ideias vamos começar por realizar uma atividade na qual propomos que olhem para cada um destes cartões com diferentes temas presentes na mesa e nos digam quais os mais importantes e porquê. Se acharem que um cartão não pertence na mesa, podemos retira-lo e discutir o porquê. Se faltarem cartões poderão adicionar novos cartões. Podemos começar?"

Ciências ULisboa

Focus Group with the Homeless and the Technicians

5. Perform a 60-minute (max) discussion using the card themes selected and created by the homeless and technicians.
    a. See card themes below;
    b. Use them to start a topic but delve deeper when the participants have something more to say by doing probes;
    c. Don't make questions that have already been answered by the participants;
    d. When the answers are not satisfactory in detail, find alternative questions, to find information;
    e. Make the participant talk, not you.
    f. Don't be afraid of silences. Silences are good; they make the participant think and delve deeper. Don't rush.

6. Start by the technological devices cards and ask the participants to choose the most important to them:
    a. "Destes cartões que contêm dispositivos selecionem os mais importantes. Existem outros? Quais?"
    b. Questions:
        i. "Porque é importante este dispositivo na sua vida?"
        ii. "Quais as atividades que realiza com o mesmo?"
        iii. "Porque não usa o dispositivo X?"

7. Next go to the cards with the topic of ways of getting information and communications.
    a. "Agora relativo à forma como obtêm informação, qual as formas mais comuns pelas quais obtêm-na? Existem outras? Quais?"
    b. Questions:
        i. "Porque razão obtêm informação dessa forma"?
        ii. "Quais as vantagens?"
        iii. "Porque razão não usam X para obter informação?"

8. Next go to the cards with the topic of activities done by individuals in homeless situation.
    a. "Destas atividades quais as mais importantes para vocês? Existem outras? Quais?"
    b. Questions:
        i. "Porque razão são estas atividades importantes?"
        ii. "Nestas atividades recorrem a algum tipo de tecnologia?"

9. Next go to the cards with the topic of problems that individuals on homeless situation find.
    a. "Destes problemas quais os que mais afetam a vossa vida? Existem outros? Quais?"
    b. Questions:
        i. "De que forma é que estes problemas afetam a vossa vida?"
        ii. "Estes problemas poderiam ser resolvidos usando tecnologia? Como?"

10. Ask if any participant has questions and thank participants.

Ciências ULisboa

Focus Group with the Homeless and the Technicians

Card Themes

- Dispositivos
  - Telefone
  - Telemóvel
  - Smartphone
  - Tablet
  - Computador
- Formas de Comunicação e Obtenção de Informação
  - Redes Sociais
  - Serviço de Mail
  - Chamadas
  - Mensagens por texto
  - Boca a Boca
- Atividades
  - Sobrevivência
  - Manter contacto com os amigos
  - Manter contacto com a família
  - Contactar os serviços de apoio
  - Encontrar emprego
  - Ser contactado pelos empregadores
  - Pagar as contas
  - Aprender novas capacidades
  - Segurança
  - Entretenimento
  - Contactar serviços de urgência
  - Contactar serviços médicos
- Problemas
  - Encontrar pontos de distribuição de alimentos
  - Encontrar local para passar a noite
  - Encontrar informação útil
  - Encontrar o local de balneários
  - Falta de acesso a infraestruturas
  - Risco de roubo
  - Manter dispositivos
  - Falta de rendimentos

Appendix C

Prospective Evaluation Script

Understanding the technology uses and the information and communication needs of the homeless

Homeless People Prospective Evaluation Script

Objective and Design:

This workshop aims at gathering information regarding the information and communication needs of homeless people, the role of technology in their daily life and find the usefulness of IVR in the homeless reality. This workshop will take place in “Espaço Aberto ao Diálogo” and should be accomplished with a group of 5 to 8 people. If possible, record the audio and take pictures, but always ask for permission first. Ensure that everyone involved has the opportunity to talk, inform that everyone is allowed to leave whenever they want and that they may refuse to talk or respond to certain questions. This workshop consists in showing sceneries with the IVR system and obtaining feedback regarding it usefulness and gather new ideias and functionalities regarding IVR.

Seed Questions:

- “Em que outros cenários poderá ser usado?“
- “Quais os problemas que encontra com este cenário?”
- “Que outras funcionalidades vê usando este sistema?”

Session Introduction:

1. Start by thanking the people for participating in the study and introduce yourself and the workshop objectives.
    a. “Boa tarde/Bom dia. Obrigado mais uma vez por participarem neste estudo. Chamo-me _____ e sou _____da_____. E estamos aqui no âmbito de um projecto que visa desenvolver tecnologias que melhorem a obtenção de informação e de comunicação para as pessoas em situação de sem-abrigo. Anteriormente, já acompanhámos os voluntários nas voltas noturnas realizadas pela Comunidade Vida e Paz, nas quais tivemos um primeiro contacto com as pessoas em situação de sem-abrigo e com as suas necessidades e problemas. Posteriormente também realizamos entrevistas em grupo com voluntários e já estivemos aqui de Como tal, hoje estamos aqui para vos mostrar um sistema e as suas funcionalidades de forma a obtermos as vossas opiniões e ideias. Antes de começarmos, pergunto se posso gravar o áudio da conversa que vamos ter e se posso tirar alguma fotografias durante o decorrer da atividade. Todos os dados que recolhemos aqui, serão apenas usados para fins do estudo e está garantido o vosso anonimato. Podemos começar?”
2. Ask each of the participants to introduce themself.
    a. “Agora que já sabem um pouco sobre nós gostaríamos de saber um pouco sobre vocês. Pedia que cada um se apresentasse individualmente.”

   b. Name, age
3. Explain in a general way the IVR system developed
   a. “O objectivo do sistema que desenvolvemos é permitir a pessoas em situação de sem-abrigo obter informação útil de forma mais fácil e direta assim como permitir a troca de informação e comunicação entre os utilizadores.
4. Use a cellphone to call the system and explain
   a. “Para aceder a este serviço basta a partir de qualquer telefone ou telemóvel chamar o número grátis.

Location:

1. Explain the following localization focused scenario.
   a. “Vamos imaginar que estou aqui no Espaço Aberto ao Diálogo e que como já é tarde quero saber qual a farmácia mais perto e qual o seu horário de atendimento.“
2. Define the current location to “Espaço Aberto ao Diálogo”.
   a. Select “Localização Actual”
      i. “Vou começar por selecionar ‘Localização Actual’. Como podemos ouvir esta foi a última localização que eu defini.”
   b. Select “Inserir Localização Actual”
      i. “Para alterar a localização seleciono ‘Inserir Localização’”
   c. Search and select “Espaço Aberto ao Diálogo” from search results
      i. “Para inserir o que pretendo pesquisar tenho agora duas opções, ou escrevo manualmente usando as teclas numéricas ou falo para o telemóvel.
      ii. “Aqui temos a lista de todos os locais que foram encontrados com o termo que pesquisamos”
      iii. Para definir a minha localização agora basta apenas selecionar o local que está na lista correspondente à minha localização.
   d. Show that the current location is “Espaço Aberto ao Diálogo.
      i. “Como podemos ouvir, agora a minha localização é “Espaço Aberto ao Diálogo”
3. Show pharmacies near the your current location.
   a. Select “Pontos de Interesse Próximos”
      i. “Agora que tenho a minha localização actual correta, vou então pesquisar pela farmácia mais próxima. Começo por selecionar ‘Pontos de Interesse Próximos’”
   b. Select “Farmácias”
      i. Como podemos ouvir posso pesquisar por diversos tipos de pontos de interesse como estações de metro, terminais de autocarro, etc. No meu caso neste momento quero saber quais as farmácias mais próximas portanto seleciono ‘Farmácias’”
   c. Listen to the list of near pharmacies
      i. Como resultado obtemos uma lista de farmácias ordenadas por ordem crescente de distância. Apresentando também a distância real a que nós encontramos de cada uma das farmácias.

4. Show the address, schedule and contacts of a pharmacy.
    a. Select the closest pharmacy from the previous list.
        i. “Como eu queria saber qual o horário da farmácia mais próxima, bastamente agora selecionar a primeira opção e ouvir as informações detalhadas sobre o local.”
    b. Listen to the pharmacy details

Fórum:

1. Explain the following fórum focused scenario:
    a. “Imaginemos agora que eu estou numa situação de sem-abrigo e que quero quais os passos que devo tomar para a abandonar ou que outros tomaram.”
2. Go to forum and select topic “Informações”
    a. “Para colocar uma questão que possa ser vista e respondida por todos dirijo me ao fórum.”
    b. “Como o que pretendo é obter Informações seleciono a categoria ‘Informações’”
3. Create new topic with the question
    a. Seleciono ‘Criar Tópico’ e digo o que pretendo perguntar.
    b. A partir de agora este tópico é público e qualquer pessoa que aceda ao fórum poderá ouvi-lo e responder ao mesmo.
4. Answer to the topic
5. Check answers to the topic
    a. Para verificar as respostas basta selecionar ‘Ouvir respostas’ e ouvirei as respostas ao tópico por ordem de recência
6. Vote in the topic
    a. “Se os utilizadores acharem este tópico importante para todos, puderam votar dele. Votar no tópico fará com que este ganhe relevância no fórum e por que seja tocado primeiro que outros.”

Requests/ Tickets:

1. Explain the following request focused scenario.
    a. “Imaginemos agora que preciso de um cobertor e que não sei onde o obter.“
2. Create request/ticket asking for a blanket.
    a. Select “Criar pedido”.
        i. “Para isso vamos fazer um pedido, selecionado ‘Criar pedido”.
    b. Record audio asking for a blanket and submit record
        i. “Agora basta eu dizer o que pretendo, neste caso digo que quero um cobertor e submeter o pedido”
3. Simulate an institution or association answering the question
    a. “Este pedido seria ouvido, por exemplo ,por um voluntário da Comunidade Vida e Paz confirmando que me iria entregar um cobertor.”
4. Listen to answer and explain possibility of talking back.
    a. Select “Ouvir pedidos”
        i. “Para ouvirmos a resposta da associação seleciono ouvir pedidos”
    b. Select the request create before

   i. “Selecionamos o pedidos que criamos anteriormente”.
c. Select “Ouvir respostas”
   i. “E selecionamos ouvir respostas”
   ii. “Caso eu ficasse com alguma dúvida ou não estivesse disponível nesse dia poderia enviar uma nova mensagem no contexto deste pedido”

Routes:

1. Explain the following routes focused scenario.
   a. “Imaginemos agora que eu não sei nem quando, nem onde passam as carrinhas da Comunidade Vida e Paz e que pretendo ser avisado com antecedência quando é que a carrinha está num local específico.“
2. Listen to routes and route points.
   a. Select “Rotas” and then “Rota A”
      i. “Primeiro começo por selecionar Rotas.”
      ii. “E obtenho uma lista de todas as Rotas da Comunidade. No meu caso estou interessado na Rota A portanto seleciono a mesma, para obter os pontos onde as carrinhas passam e o seu horário.”
   b. Listen to route points.
3. Subscribe to the second route point.
   a. “Como sei que o segundo ponto da rota é o mais próximo de mim, seleciono-o. Ficando assim subscrito a esse ponto. Quando faltar pouco tempo para a carrinha passar neste ponto irei receber uma chamada a indicar que me deverei deslocar ao lugar do ponto.
4. Terminate call and wait to receive route point call from system.

Understanding the technology uses and the information and communication needs of the homeless

Volunteers and Technicians Prospective Evaluation Script

Objective and Design:

This workshop aims at gathering information regarding the information and communication needs of homeless people, the role of technology in their daily life and find the usefulness of IVR in the homeless reality. This workshop will take place in “Comunidade Vida e Paz” and should be accomplished with groups of 5 to 8 people. If possible, record the audio and take pictures, but always ask for permission first. Ensure that everyone involved has the opportunity to talk, inform that everyone is allowed to leave whenever they want and that they may refuse to talk or respond to certain questions. This workshop consists in showing sceneries with the IVR system and obtaining feedback regarding it usefulness and gather new ideias and functionalities regarding IVR.

Seed Questions:

- “Em que outros cenários poderá ser usado?“
- “Quais os problemas que encontra com este cenário?”
- “Que outras funcionalidades vê usando este sistema?”

Session Introduction:

5. Start by thanking the people for participating in the study and introduce yourself and the workshop objectives.
    a. “Boa tarde/Bom dia. Obrigado mais uma vez por participarem neste estudo. Chamo-me _____ e sou _____da_____. E estamos aqui no âmbito de um projecto que visa desenvolver tecnologias que melhorem a obtenção de informação e de comunicação para as pessoas em situação de sem-abrigo. Anteriormente, já acompanhámos os voluntários nas voltas noturnas realizadas pela Comunidade Vida e Paz, nas quais tivemos um primeiro contacto com as pessoas em situação de sem-abrigo e com as suas necessidades e problemas. Posteriormente também realizamos entrevistas em grupo com voluntários e já estivemos aqui de Como tal, hoje estamos aqui para vos mostrar um sistema e as suas funcionalidades de forma a obtermos as vossas opiniões e ideias. Antes de começarmos, pergunto se posso gravar o áudio da conversa que vamos ter e se posso tirar alguma fotografias durante o decorrer da atividade. Todos os dados que recolhemos aqui, serão apenas usados para fins do estudo e está garantido o vosso anonimato. Podemos começar?”
6. Ask each of the participants to introduce themself.
    a. “Agora que já sabem um pouco sobre nós gostaríamos de saber um pouco sobre vocês. Pedia que cada um se apresentasse individualmente.”
    b. Name, age

7. Explain in a general way the IVR system developed
    a. “O objectivo do sistema que desenvolvemos é permitir a pessoas em situação de sem-abrigo obter informação útil de forma mais fácil e direta assim como permitir a troca de informação e comunicação entre os utilizadores.
8. Use a cellphone to call the system and explain
    a. “Para aceder a este serviço basta a partir de qualquer telefone ou telemóvel chamar o número grátis.

Location:

9. Explain the following localization focused scenario.
    a. “Vamos imaginar que estou aqui no Espaço Aberto ao Diálogo e que como já é tarde quero saber qual a farmácia mais perto e qual o seu horário de atendimento.“
10. Define the current location to “Espaço Aberto ao Diálogo”.
    a. Select “Localização Actual”
        i. “Vou começar por selecionar ‘Localização Actual’. Como podemos ouvir esta foi a última localização que eu defini.”
    b. Select “Inserir Localização Actual”
        i. “Para alterar a localização seleciono ‘Inserir Localização’”
    c. Search and select “Espaço Aberto ao Diálogo” from search results
        i. “Para inserir o que pretendo pesquisar tenho agora duas opções, ou escrevo manualmente usando as teclas numéricas ou falo para o telemóvel.
        ii. “Aqui temos a lista de todos os locais que foram encontrados com o termo que pesquisamos”
        iii. Para definir a minha localização agora basta apenas selecionar o local que está na lista correspondente à minha localização.
    d. Show that the current location is “Espaço Aberto ao Diálogo.
        i. “Como podemos ouvir, agora a minha localização é “Espaço Aberto ao Diálogo”
11. Show pharmacies near the your current location.
    a. Select “Pontos de Interesse Próximos”
        i. “Agora que tenho a minha localização actual correta, vou então pesquisar pela farmácia mais próxima. Começo por selecionar ‘Pontos de Interesse Próximos’”
    b. Select “Farmácias”
        i. Como podemos ouvir posso pesquisar por diversos tipos de pontos de interesse como estações de metro, terminais de autocarro, etc. No meu caso neste momento quero saber quais as farmácias mais próximas portanto seleciono ‘Farmácias’”
    c. Listen to the list of near pharmacies
        i. Como resultado obtemos uma lista de farmácias ordenadas por ordem crescente de distância. Apresentando também a distância real a que nós encontramos de cada uma das farmácias.
12. Show the address, schedule and contacts of a pharmacy.

   a. Select the closest pharmacy from the previous list.
      i. “Como eu queria saber qual o horário da farmácia mais próxima, bastamente agora selecionar a primeira opção e ouvir as informações detalhadas sobre o local.”
   b. Listen to the pharmacy details

Fórum:

7. Explain the following fórum focused scenario:
   a. “Imaginemos agora que eu estou numa situação de sem-abrigo e que quero quais os passos que devo tomar para a abandonar ou que outros tomaram.”
8. Go to forum and select topic “Informações”
   a. “Para colocar uma questão que possa ser vista e respondida por todos dirijo me ao fórum.”
   b. “Como o que pretendo é obter Informações seleciono a categoria ‘Informações’”
9. Create new topic with the question
   a. Seleciono ‘Criar Tópico’ e digo o que pretendo perguntar.
   b. A partir de agora este tópico é público e qualquer pessoa que aceda ao fórum poderá ouvi-lo e responder ao mesmo.
10. Answer to the topic
11. Check answers to the topic
   a. Para verificar as respostas basta selecionar ‘Ouvir respostas’ e ouvirei as respostas ao tópico por ordem de recência
12. Vote in the topic
   a. “Se os utilizadores acharem este tópico importante para todos, puderam votar dele. Votar no tópico fará com que este ganhe relevância no fórum e por que seja tocado primeiro que outros.”

Requests/ Tickets:

5. Explain the following request focused scenario.
   a. “Imaginemos agora que preciso de um cobertor e que não sei onde o obter.“
6. Create request/ticket asking for a blanket.
   a. Select “Criar pedido”.
      i. “Para isso vamos fazer um pedido, selecionado ‘Criar pedido”.
   b. Record audio asking for a blanket and submit record
      i. “Agora basta eu dizer o que pretendo, neste caso digo que quero um cobertor e submeter o pedido”
7. Simulate an institution or association answering the question
   a. “Este pedido seria ouvido, por exemplo ,por um voluntário da Comunidade Vida e Paz confirmando que me iria entregar um cobertor.”
8. Listen to answer and explain possibility of talking back.
   a. Select “Ouvir pedidos”
      i. “Para ouvirmos a resposta da associação seleciono ouvir pedidos”
   b. Select the request create before
      i. “Selecionamos o pedidos que criamos anteriormente”.

   c. Select “Ouvir respostas”
      i. “E selecionamos ouvir respostas”
      ii. “Caso eu ficasse com alguma dúvida ou não estivesse disponível nesse dia poderia enviar uma nova mensagem no contexto deste pedido”

Routes:

1. Explain the following routes focused scenario.
   a. “Imaginemos agora que eu não sei nem quando, nem onde passam as carrinhas da Comunidade Vida e Paz e que pretendo ser avisado com antecedência quando é que a carrinha está num local específico.“
2. Listen to routes and route points.
   a. Select “Rotas” and then “Rota A”
      i. “Primeiro começo por selecionar Rotas.”
      ii. “E obtenho uma lista de todas as Rotas da Comunidade. No meu caso estou interessado na Rota A portanto seleciono a mesma, para obter os pontos onde as carrinhas passam e o seu horário.”
   b. Listen to route points.
3. Subscribe to the second route point.
   a. “Como sei que o segundo ponto da rota é o mais próximo de mim, seleciono-o. Ficando assim subscrito a esse ponto. Quando faltar pouco tempo para a carrinha passar neste ponto irei receber uma chamada a indicar que me deverei deslocar ao lugar do ponto.
4. Terminate call and wait to receive route point call from system.

Login/Account:

1. Explain the idea behind a remote account accessed through a phone call.
   a. “Esta ideia passa por permitir que as pessoas em situação de sem-abrigo consigam guardar informação e dados sobre si e as sua actividades. Como tal as pessoas teriam uma conta que acederiam através do seu telefone ou telemóvel realizando uma chamada para o mesmo.”

Reminders:

1. Explain the following reminder focused scenario.
   a. “Imaginemos que uma pessoa em situação de sem-abrigo que encontramos numa das voltas tem uma consulta no médico marcada e que não queremos que ela se esqueça de ir à consulta.”
2. Create a reminder.
   a. Select “Lembrete”
      i. “Para isso vou criar um lembrete para esta pessoa em específico, portanto seleciono ‘Lembrete’”
   b. Select “Criar Lembrete”
      i. “Seleciono ‘Criar Lembrete’”
   c. Record reminder content and input the date of appointment.
      i. “Digo qual o conteúdo do lembrete neste caso uma consulta no médico. E insiro a data da consulta.”

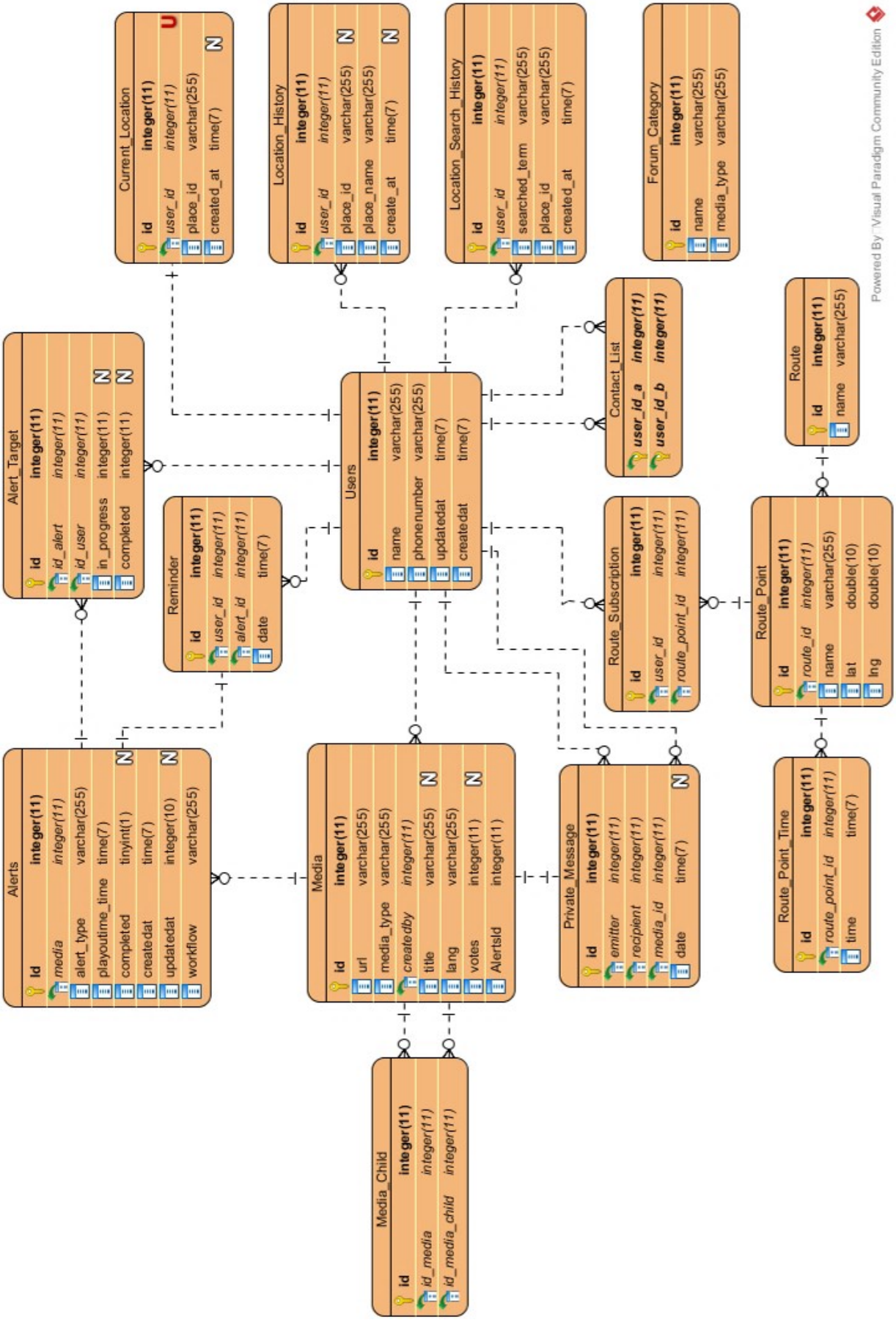
3. Receive call with reminder
    a. “A pessoa para quem criamos o lembrete, horas antes, vai receber um telefonema da plataforma com o conteúdo do lembrete avisando-o sobre a sua consulta no médico.”
4. Listen to previous remainders
    a. “Caso queira ouvir este lembrete de novo ou todos os lembretes anteriores, basta selecionar ‘Ouvir Lembretes’”

Private messages:

1. Explain the following private message focused scenario.
    a. “Imaginemos que sou um voluntário e que quero enviar uma mensagem de voz privada a uma das pessoas em situação de sem-abrigo que encontrei anteriormente numa das voltas.”
2. Create private message
    a. Select “Lista de contactos”
        i. “Para enviar uma mensagem privada começo por selecionar ‘Lista de Contactos’”
    b. Select the desired contact
        i. Seleciono o contacto para quem quero enviar a mensagem neste caso seleciono ‘Andre’”.
    c. Record and submit the private message
        i. Digo o que pretendo que o André ouça e submeto a mensagem. Neste instante o André vai receber uma chamada com a minha mensagem.
3. Receive call with private message
4. Listen to previous messages
    a. Caso o André tenha perdido o telefonema este pode ouvir a mensagem novamente selecionado no menu ‘Ouvir mensagens anteriores’

Appendix D

Database Entity Relationship Diagram


Current_Location
id integer(11) U
user_id integer(11)
place_id varchar(255)
created_at time(7) N
Location_History
id integer(11)
user_id integer(11)
place_id varchar(255) N
place_name varchar(255)
create_at time(7) N
Location_Search_History
id integer(11)
user_id integer(11)
searched_term varchar(255)
place_id varchar(255)
created_at time(7)
Forum_Category
id integer(11)
name varchar(255)
media_type varchar(255)
Alert_Target
id integer(11)
id_alert integer(11)
id_user integer(11)
in_progress integer(11) N
completed integer(11) N
Users
id integer(11)
name varchar(255)
phonenumber varchar(255)
updatedat time(7)
createdat time(7)
Contact_List
user_id_a integer(11)
user_id_b integer(11)
Route
id integer(11)
name varchar(255)
Reminder
id integer(11)
user_id integer(11)
alert_id integer(11)
date time(7)
Route_Subscription
id integer(11)
user_id integer(11)
route_point_id integer(11)
Route_Point
id integer(11)
route_id integer(11)
name varchar(255)
lat double(10)
lng double(10)
Alerts
id integer(11)
media integer(11)
alert_type varchar(255)
playoutime_time time(7)
completed tinyint(1) N
createdat time(7)
updatedat integer(10) N
workflow varchar(255)
Media
id integer(11)
url varchar(255)
media_type varchar(255)
createdby integer(11)
title varchar(255) N
lang varchar(255)
votes integer(11) N
AlertsId integer(11)
Private_Message
id integer(11)
emitter integer(11)
recipient integer(11)
media_id integer(11)
date time(7) N
Route_Point_Time
id integer(11)
route_point_id integer(11)
time time(7)
Media_Child
id integer(11)
id_media integer(11)
id_media_child integer(11)
Powered By Visual Paradigm Community Edition

Appendix E

M.A.P.A - Requirements Analysis Report and Prototyping

Relatório de Análise de Requisitos e Prototipagem

Plataforma Online para o Projeto "MAPA"

(02/11/17 – Versão 1.0)

Sumário

Introdução

Objetivo

O objetivo deste projeto é a implementação de uma plataforma online de apoio aos utentes da associação num contexto pós-alta.

Enquadramento

O sistema em que a aplicação se insere é formado pelas seguintes entidades:

- Utente – indivíduos em pós-alta
- Coordenador – entidade que presta cuidados aos utentes e gere ofertas de trabalho.
- Contratante – empresa que divulga ofertas de trabalho.

Riscos

O primeiro risco relaciona-se com a tecnologia a utilizar. A equipa propõe-se a utilizar Python e a framework de criação de websites Django. Existindo algum desconhecimento relativo a esta framwork por parte da equipa.

O segundo risco prende.se com o tempo disponível, uma vez que a equipa está a realizar a dissertação ao mesmo tempo que efetua este projeto.

Requisitos do Sistema

Este sistema é responsável por manter em contacto utentes em contexto pós-alta com a instituição. Deverá manter as informações relevantes de um utente e permitir que tenha acesso a serviços e ajuda de forma remota.

O sistema deve:

- **Mostrar página inicial** – para um utilizador aceder à plataforma terá primeiro que passar por esta página. Aqui poderá fazer login e ver informação sobre a Plataforma M.A.P.A.

- **Permitir o registo de utentes** – para um utilizador poder usufruir da plataforma terá que se registar primeiro, utilizando uma conta e-mail.

- **Permitir fazer login** – para aceder às funcionalidades da plataforma o utilizador terá que fazer login usando o seu nome de utilizador e palavra-passe.

- **Permitir criar e editar perfil visível ao utente** – o utente, após registo, terá de criar o seu perfil com dados como o seu nome, data de nascimento, habilitações. Podendo mais tarde alterar esses dados.

- **Mostrar perfil visível ao utente** – esta funcionalidade permite visualizar informação relativa ao utente. Esta informação foi anteriormente inserida pelo utente.

- **Permitir criar e editar perfil visível ao coordenador** – o coordenador pode inserir dados relativos ao utente que apenas podem ver visualizados pelos coordenadores. Estes dados contemplam observações personalizadas e histórico de percurso.

- **Mostrar perfil visível ao coordenador** – esta funcionalidade permite visualizar informação relativa ao utente que foi anteriormente inserida pelo coordenador.

- **Mostrar todos os utentes registados na plataforma** – o coordenado pode ver todos os utentes registados e fazer pesquisas por utentes específicos.

- **Criar e mostrar posts no fórum** – esta funcionalidade vai permitir aos utilizadores criarem e visualizarem posts em certas categorias do fórum.

- **Gerir categorias e posts do fórum** – o coordenador pode criar categorias no fórum e remover posts.

- **Mostrar informação** – esta funcionalidade permite aos utilizadores visualizar informação criada pelos coordenadores. Esta informação consiste em documentos e artigos.

- **Criar páginas de informação** – o coordenador pode criar dinamicamente páginas com a informação que desejar (artigos, documentos, …) para todos os utilizadores da plataforma.

- **Subter anúncios de emprego** – esta funcionalidade permite ao contratante submeter anúncios de emprego para a plataforma.

- **Mostrar anúncios de emprego submetidos** – o coordenador pode visualizar todos os anúncios de emprego submetidos pelos contratantes. O contratador pode ver aos seus anúncios submetidos e ver o seu estado.

- **Editar anúncios de emprego submetidos e publicar** – o coordenador pode editar os anúncios submetidos pelo contratante e posteriormente publicá-los, ficando assim disponíveis para os utentes.

- **Mostrar anúncios de emprego publicados** – o utente pode ver todos os anúncios de emprego publicados, e demonstrar interesse num dado anúncio.

- **Criar e editar informação sobre habitações disponíveis** – o coordenador pode criar e editar propostas de habitação disponíveis.

- **Mostrar habitações disponíveis** – esta funcionalidade permite aos utilizadores visualizar habitações disponíveis e os dados relativos a essa habitação.

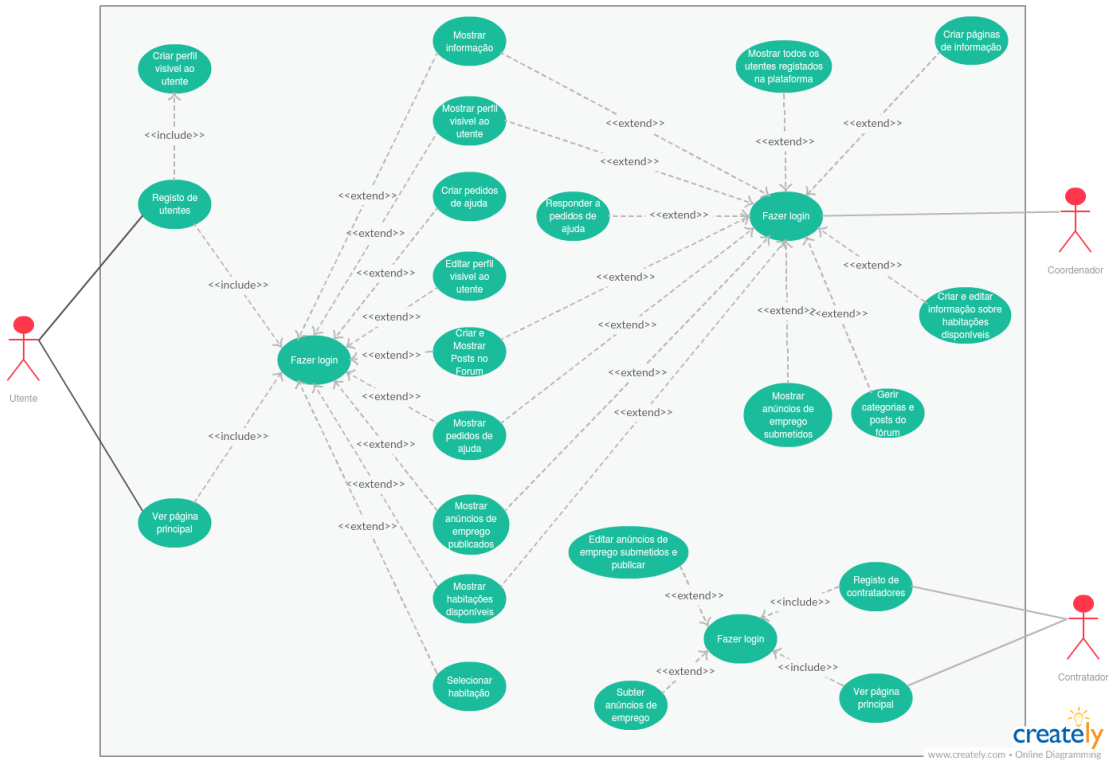
- **Permitir selecionar habitação em que está interessado** – o utente pode demonstrar que está interessado numa dada habitação.

- **Mostrar pedidos de ajuda –** o coordenador pode visualizar todos os pedidos de ajuda existentes. O utente pode ver os seus pedidos de ajuda e as respostas dos coordenadores.

- **Responder a pedidos de ajuda –** coordenador pode responder a pedidos de ajuda.

- **Permitir criar e enviar pedidos de ajuda** – esta funcionalidade permite ao utente criar pedidos de ajuda individuais e com uma categoria especifica.

Modelo de casos de utilização



Atores

Utente – utente do sistema de apoio pós-alta que procura manter-se em contacto com a associação e que procura auxílio em obter emprego ou habitação.

Coordenador – entidade pertencente à associação que pretende ajudar e condenar os utentes e coordenar as atividades na plataforma.

Contratador – entidade que representa uma empresa que tem propostas de emprego e que procura trabalhadores.

Casos de Utilização e Prototipagem

Registo de Utilizadores

O sistema permite dois tipos de utilizadores registarem-se na plataforma: utentes e contratadores. No caso dos utentes será lhes pedida alguma informação pessoal durante o registo, enquanto que aos contratadores apenas lhes será pedido o nome da empresa que pretende contratar. Para efetuar o registo, em ambos os casos será necessário um e-mail.

Figura 1 - Protótipo de Registo de Utentes

Figura 2 - Protótipo do Registo de um Contratador

Página Inicial

Existem 4 páginas iniciais diferentes:

- A página inicial visível a todos que visitem a plataforma, esta página vai conter informação relativa à instituição e ao objetivo da plataforma. Vai permitir também aos utilizadores da plataforma autenticarem-se.

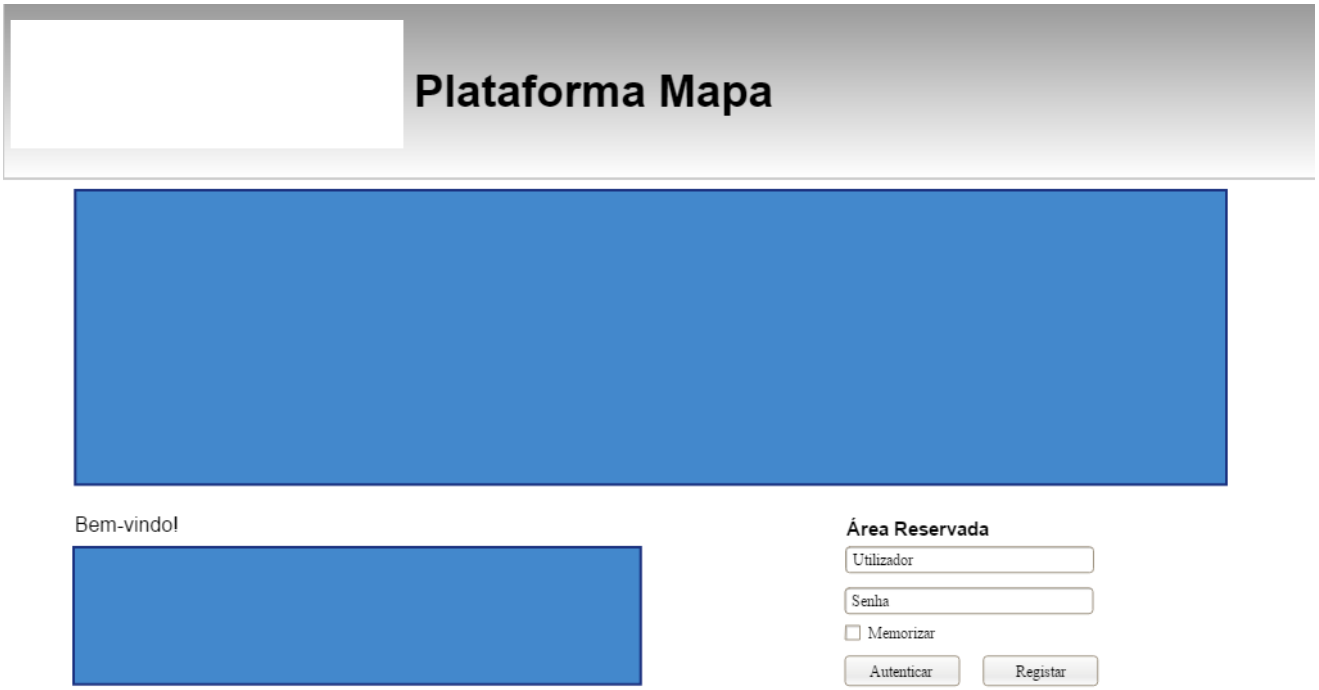


Figura 3 - Protótipo da Página Inicial

- A página inicial após autenticação do utente. Esta página vai mostrar ao utente novas propostas de emprego, novos posts no fórum e informação que lhe seja relevante.

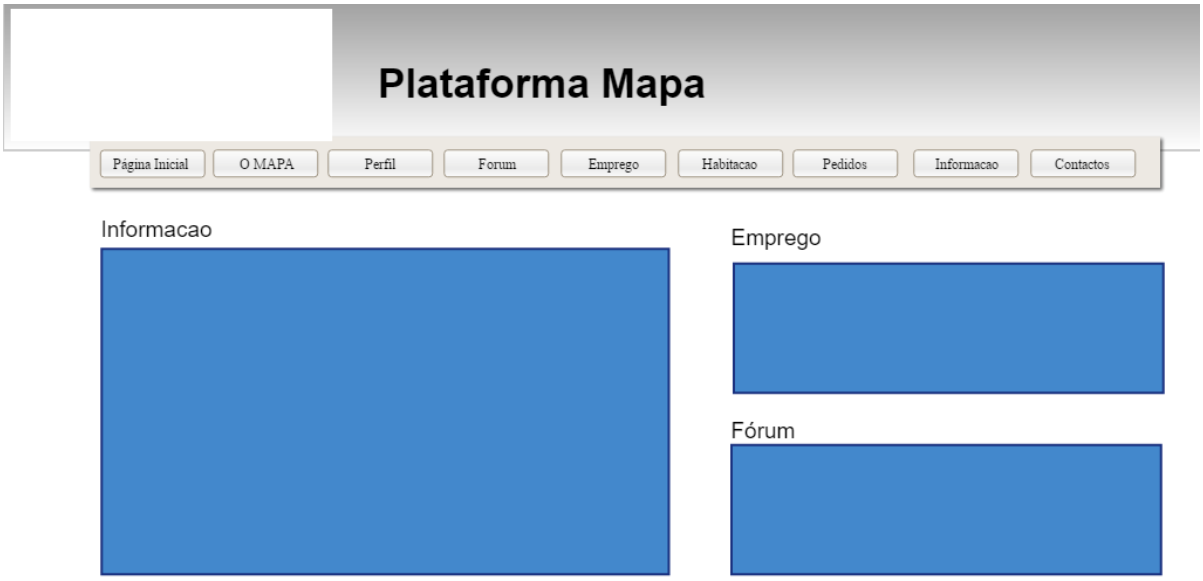


Figura 4 - Protótipo da Página Inicial de um Utente

- A página inicial após autenticação de um coordenador. Esta página vai mostrar ao coordenador novos pedidos de ajuda, novas propostas de emprego submetidas e novos posts no fórum.

Figura 5- Protótipo da Página Inicial de um Coordenador

- A página inicial após autenticação de um contratador. Esta página vai mostrar ao contratador as suas propostas de emprego submetidas e o seu estado.

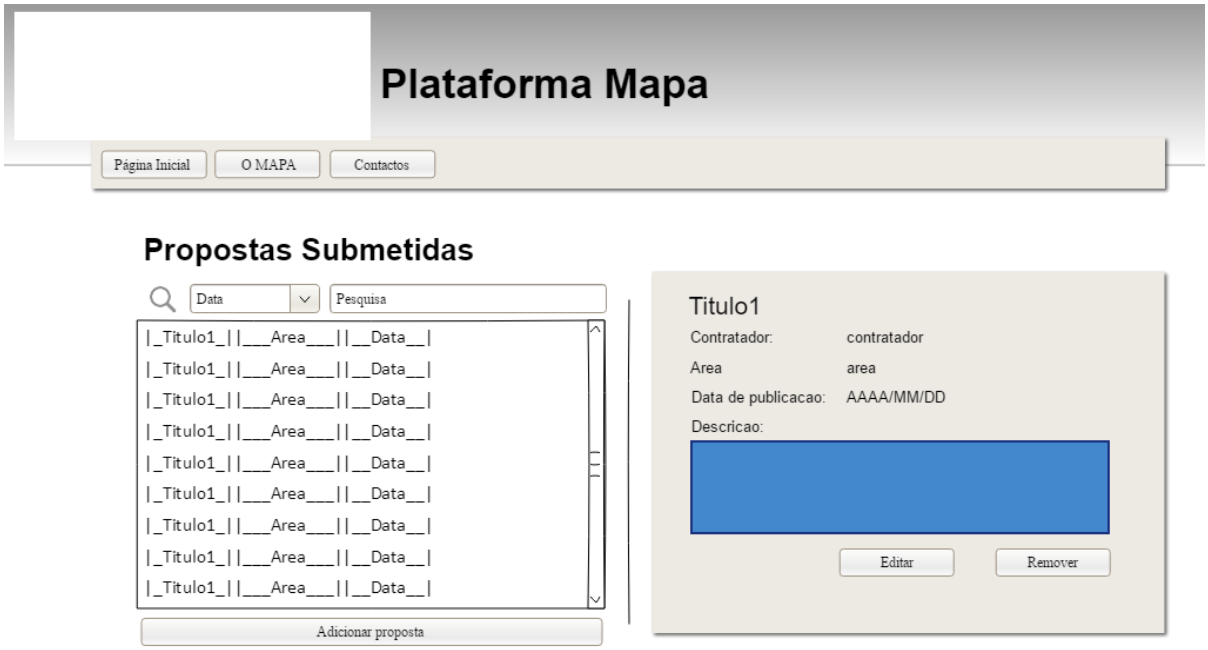


Figura 6 - Protótipo da Página Inicial de um contratador

Perfil do Utente

Um utente pode aceder ao seu perfil para ver a informação por si inserida. A partir desta página é possível o utente editar o seu perfil ou alterar a sua palavra-passe.

Figura 7 - Protótipo do perfil de um utente

Figura 8 - Protótipo da página de alteração de palavra-passe

Figura 9 - Protótipo da página de edição de um perfil por um utente

Um coordenador pode aceder a todos os utentes através de uma página onde pode pesquisar pelos mesmos através dos seus diversos atributos, como por exemplo e-mail, nome, localidade, data de nascimento, etc. O coordenador também pode criar e editar para cada utente um perfil que só pode ser visto por si e onde pode colocar dados mais sensíveis e observações relativas ao utente. No que diz respeito às observações o coordenador pode criar áreas de observação e posteriormente para cada área adicionar observações.

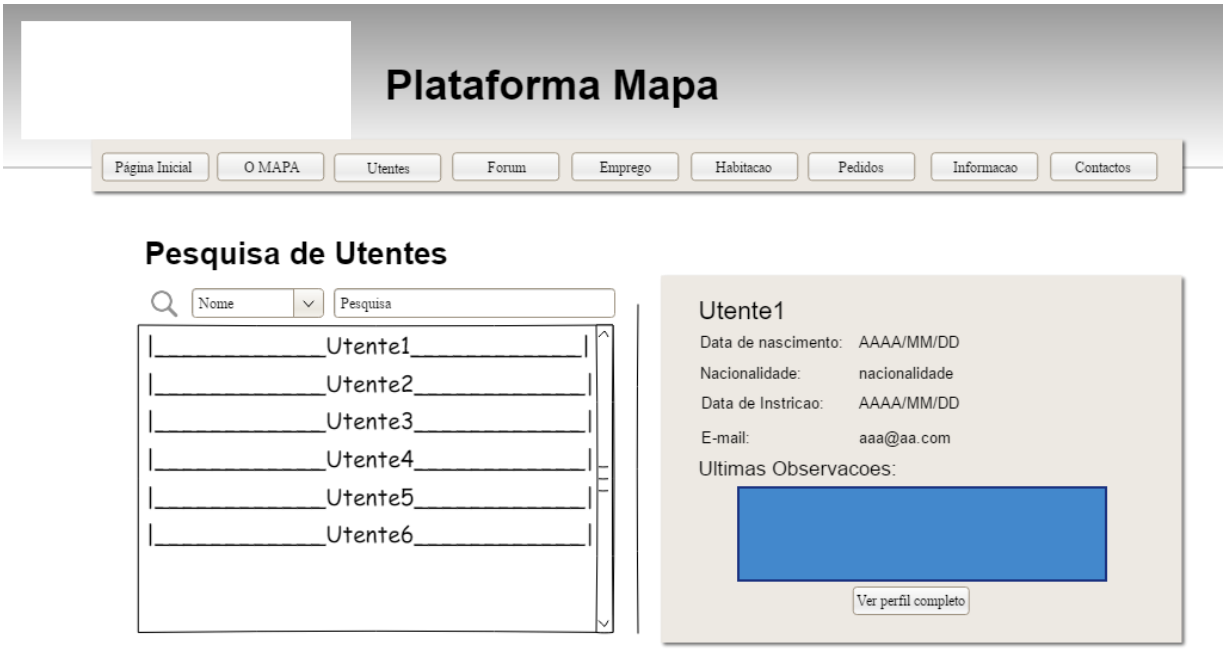


Figura 10 - Protótipo da página de pesquisa de utentes

Figura 11 - Protótipo do perfil completo de um utente

Figura 8 - Protótipo da página de edição do perfil do utente apenas visível ao coordenador

Figura 9 - Protótipo da página de adicionar e remover contactos de um perfil

Figura 10 - Protótipo da página de observações de um utente

Fórum

No fórum os coordenadores poderão criar tópicos de conversa e discussão, permitindo ao utentes e coordenadores comunicarem. O fórum e os seus posts são visíveis a todos os coordenadores e utentes.

Figura 11 - Protótipo do fórum

Emprego

Os utentes poderão pesquisar por propostas de emprego através da sua área do emprego que pretendem. E poderão candidatar-se aos empregos que sejam do seu interesse.

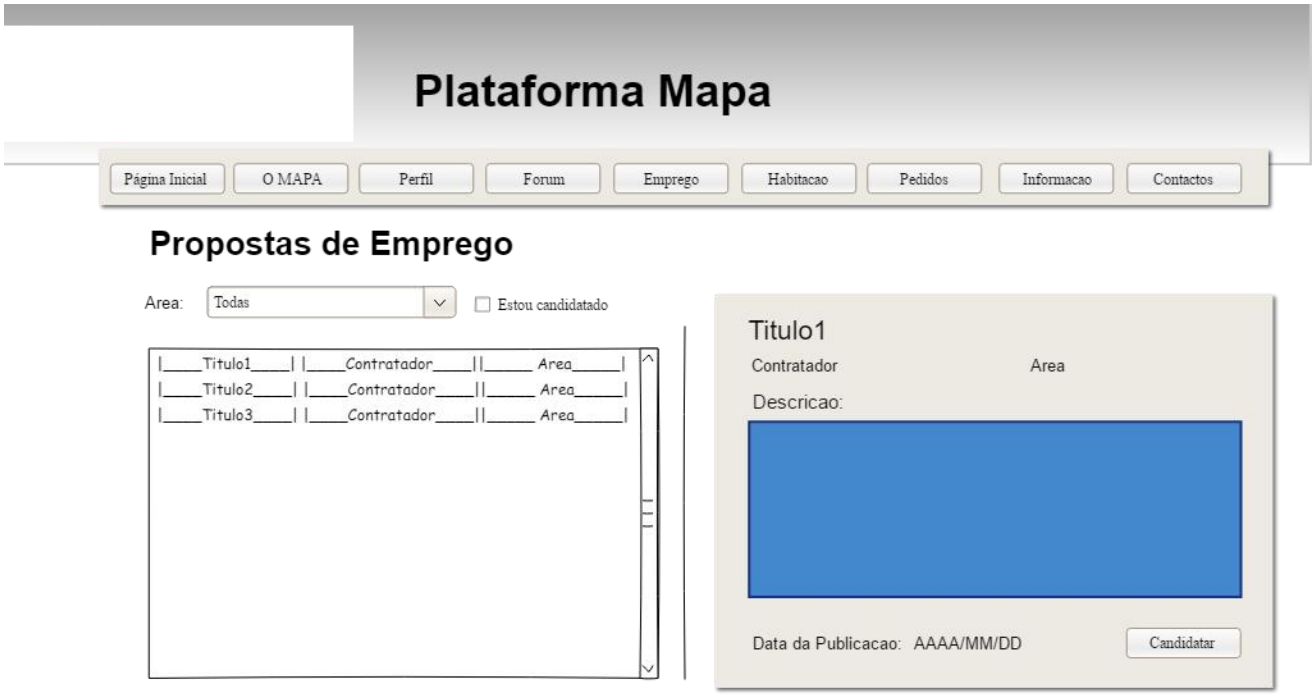


Figura 12 - Protótipo da página que permite os utentes acederem às propostas de emprego

Um contratador pode criar e submeter propostas de emprego que mais tarde serão vistas pelos coordenadores.

Figura 13 - Protótipo da página de criação de propostas de emprego de um coordenador

O coordenador pode ver propostas de emprego submetidas pelos contratadores, editar as propostas e submetê-las para ficarem disponíveis para os utentes. O coordenador pode ver também as propostas publicadas e posteriormente fecha-las, eliminá-las e ver utentes candidatos.

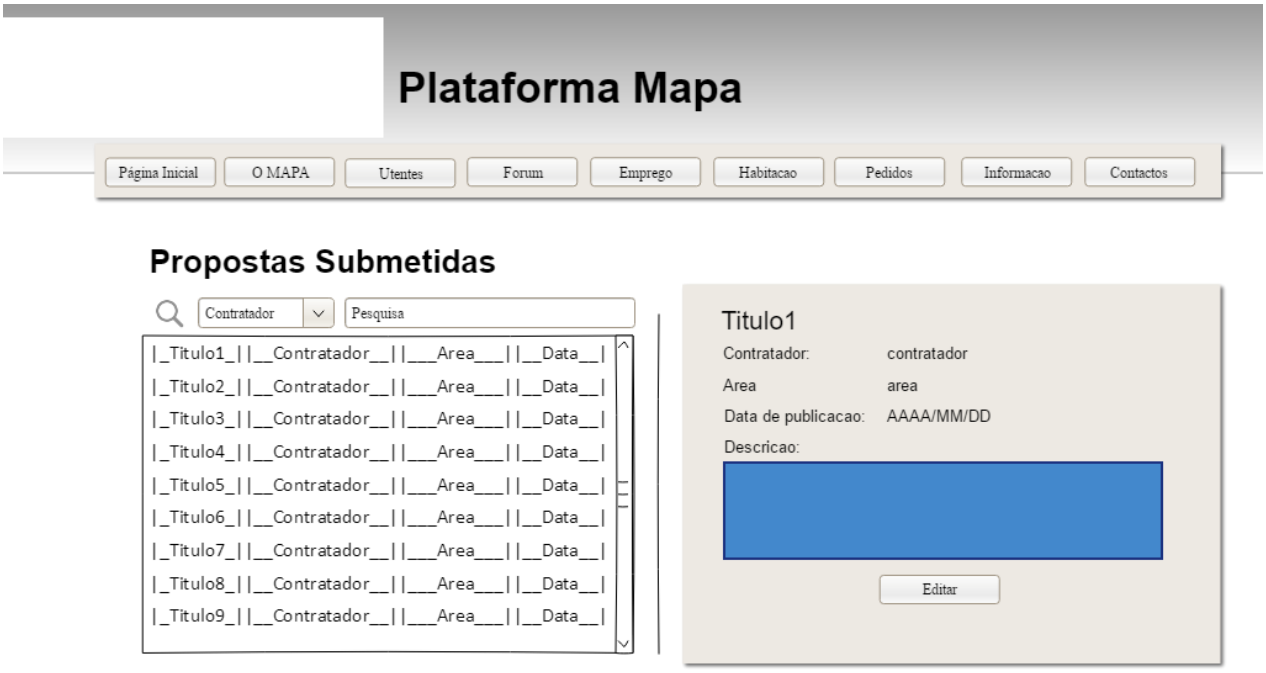


Figura 18 - Protótipo da página com propostos submetidas pelos contratadores

Figura 19 - Protótipo da página que permite ao coordenador editar e publicar uma proposta submetida por um contratador

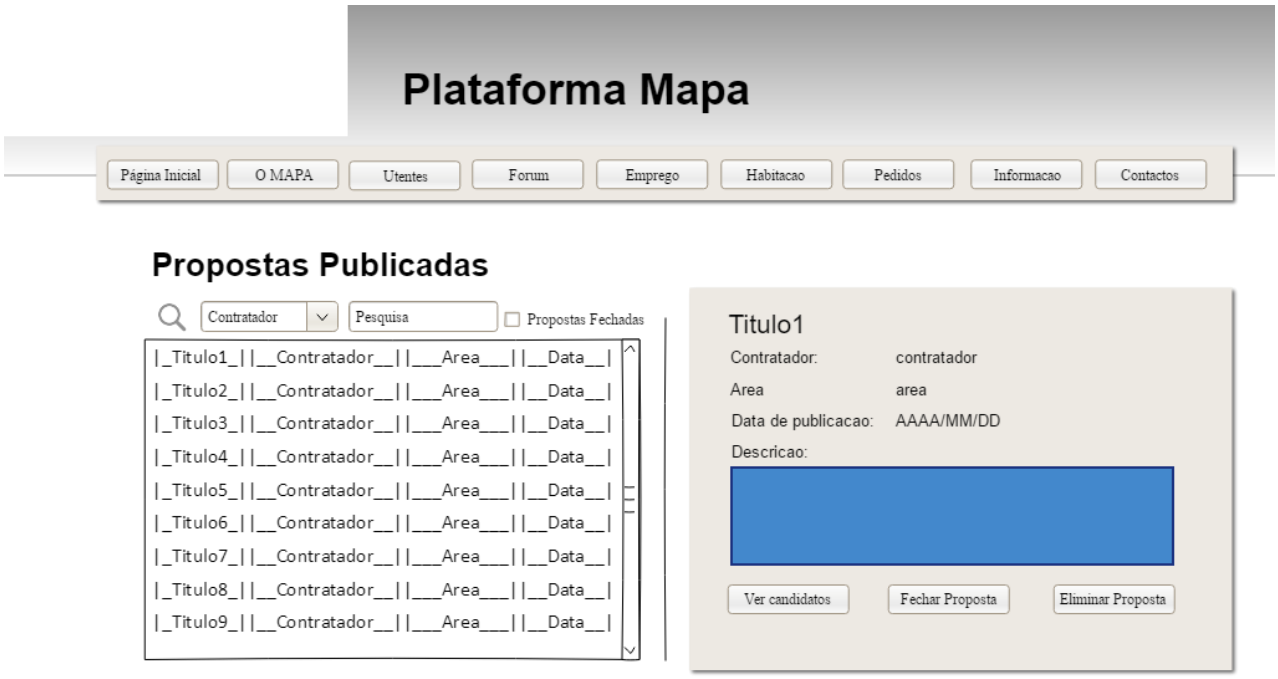


Figura 20 - Protótipo da página com as propostas publicadas ao qual o coordenador acede

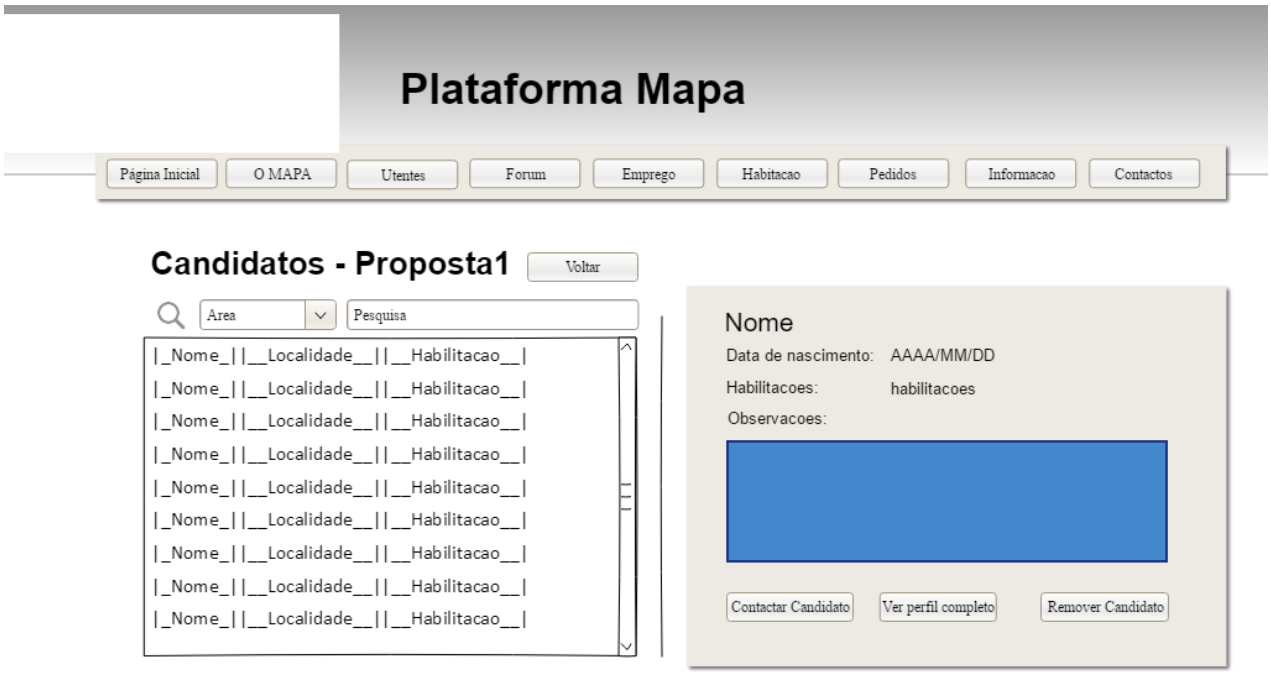


Figura 21 - Protótipo da página de candidatos a uma dada proposta de emprego

Habitação

Os utentes poderão ver as propostas de habitação e pesquisarem pelas mesmas através do nome, localização, etc. Poderão também demonstrar o seu interesse numa dada proposta.

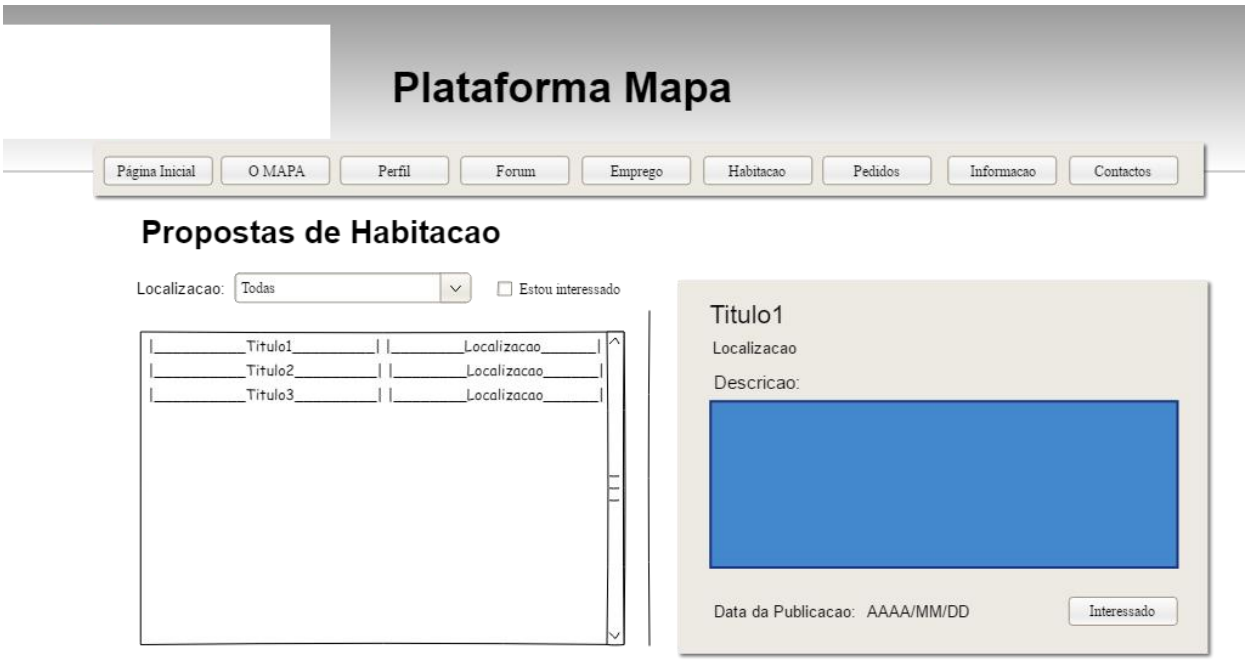


Figura 22 - Protótipo da página com propostas de habitação para os utentes

O coordenador pode criar, publicar e ver os utentes interessados nas propostas de habitação. Assim como fechá-las e elimina-las.

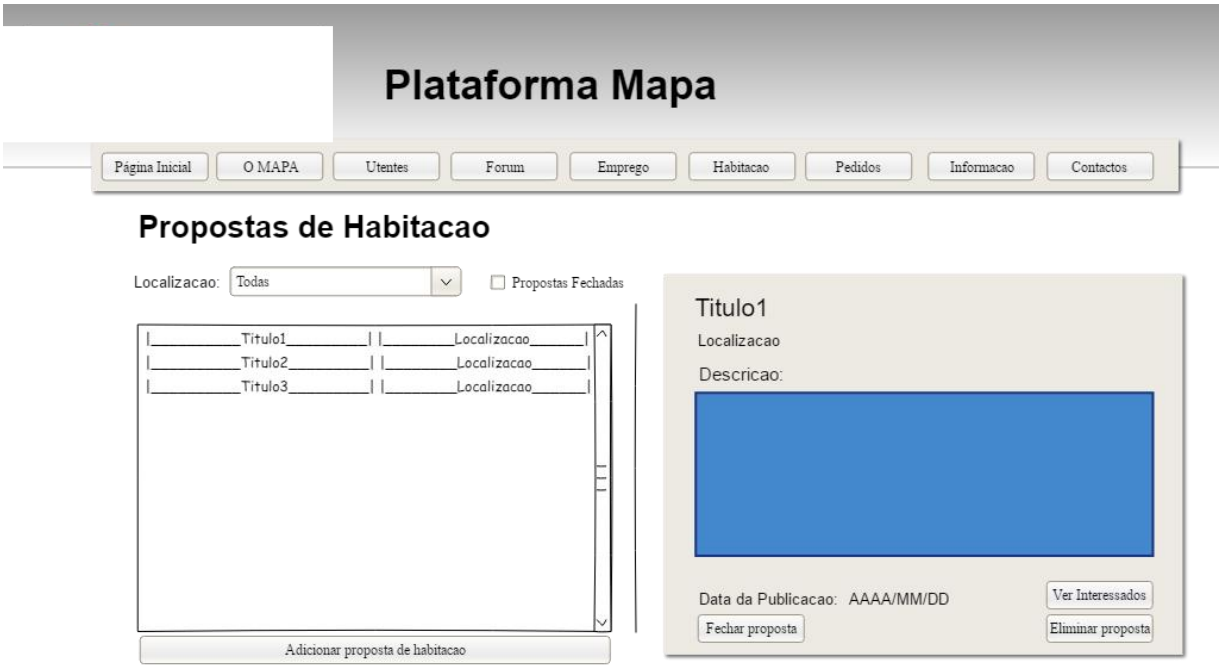


Figura 23 - Protótipo da página que permite ao coordenador aceder às propostas de habitação publicadas

Figura 24 - Protótipo da página que permite criar novas propostas de habitação

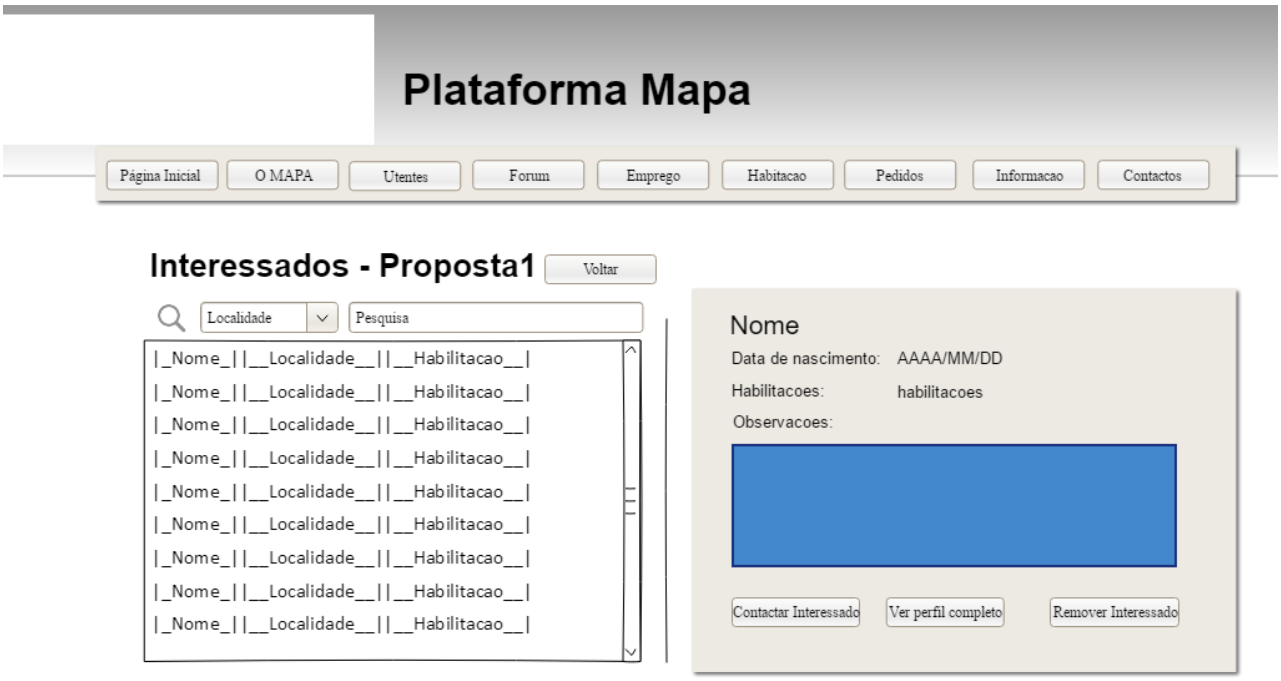


Figura 25 - Protótipo da página que mostra os utentes interessados numa dada proposta de habitação

Pedidos de Ajuda

Os utentes poderão enviar pedidos de ajuda privados aos coordenadores. Os coordenadores poderão ver todos os pedidos de ajuda e tocar mensagens com os utentes.

Figura 26 - Protótipo da página de pedidos de ajuda de um utente

Figura 27 - Protótipo de um pedido de ajuda

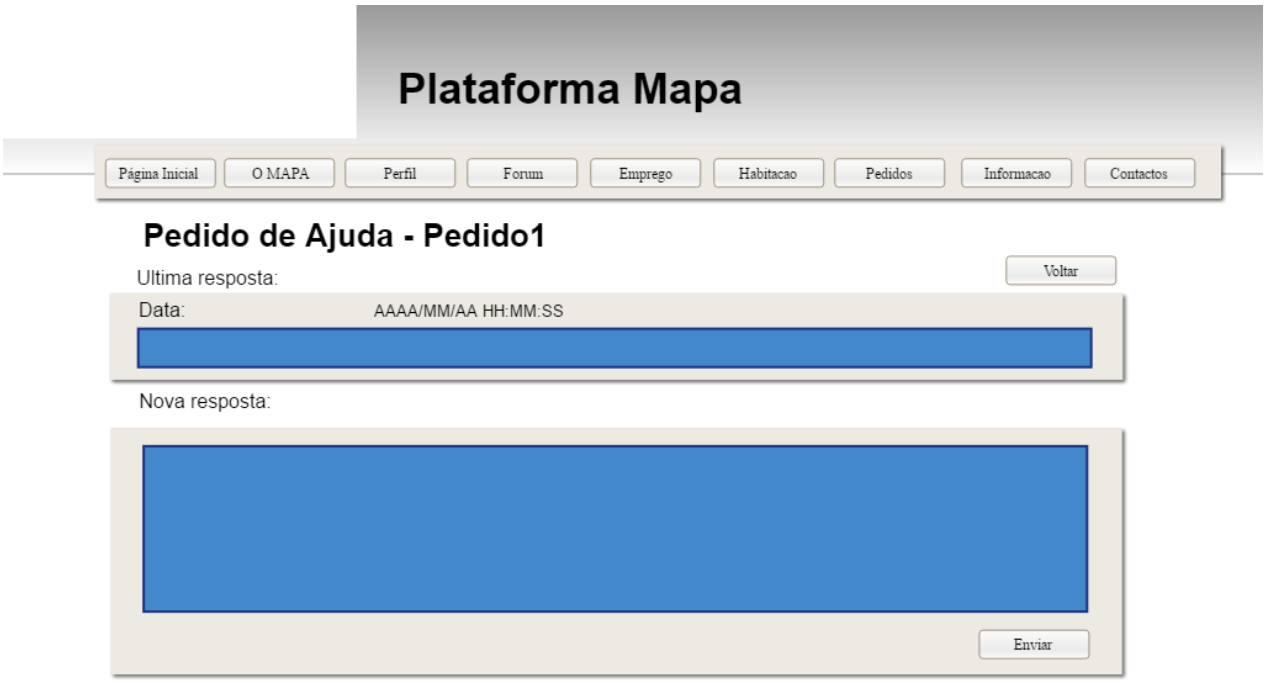


Figura 28 - Protótipo da página que permite escrever uma resposta a um pedido de ajuda

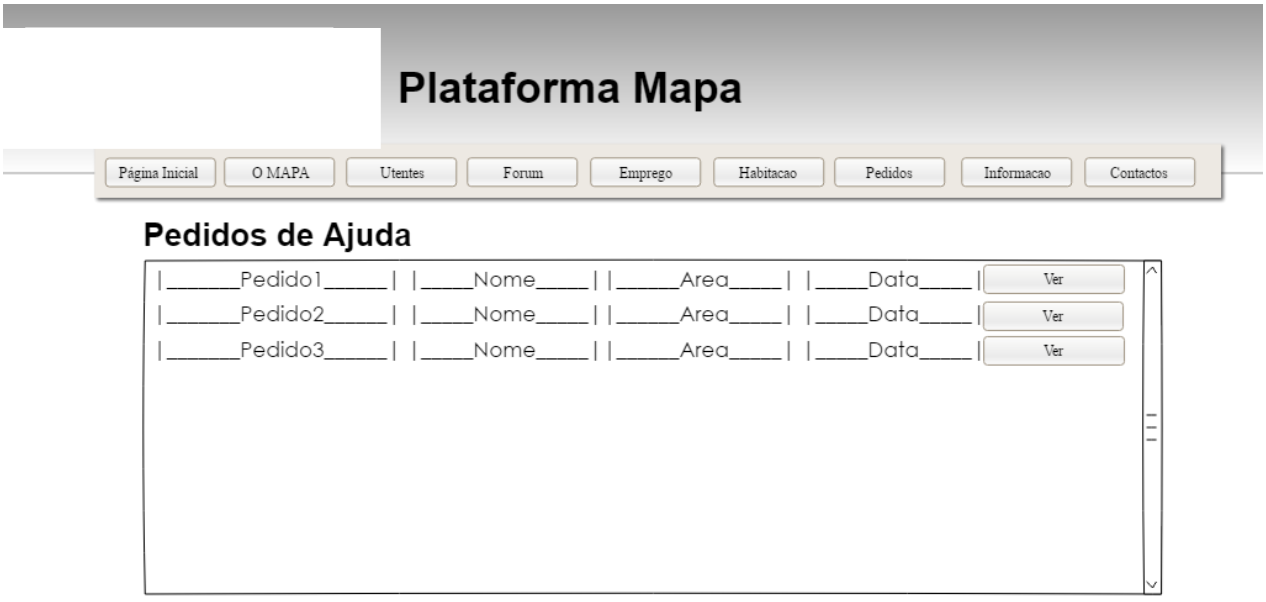


Figura 29 - Protótipo da página de pedidos de ajuda vista pelos coordenadores

Figura 30 - Protótipo da página que permite aos utentes criar um pedido de ajuda

Informação

Os utentes poderão ver informação publicada pelo coordenador. Existem dois tipos de informação: Documentos e Artigos.

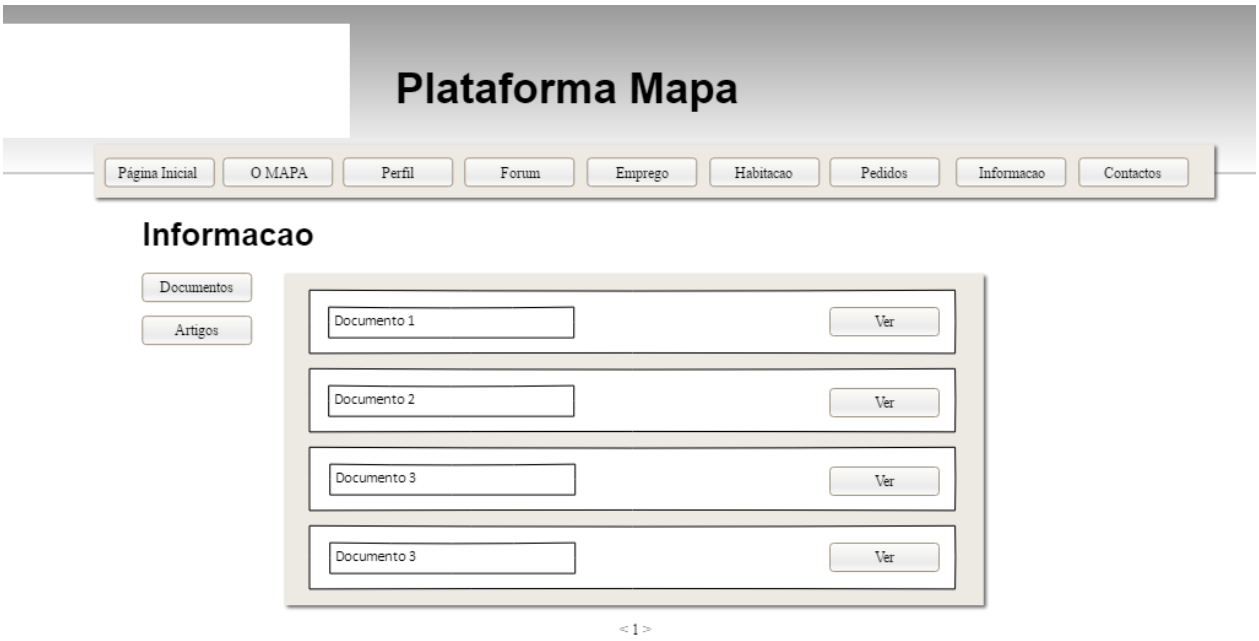


Figura 31 - Protótipo da página de Informação dos utentes

Figura 32 - Protótipo de uma página de informação

Figura 33 - Protótipo da página de informações mostrada ao coordenador

Figura 34 - Protótipo da página de criação de uma página de informação

Contractos

Está página contém informação e contractos da associação e da Plataforma MAPA.

Figura 35- Protótipo da página de contactos

O MAPA

Página que contem os objetivos da plataforma MAPA e da equipa a este associado.

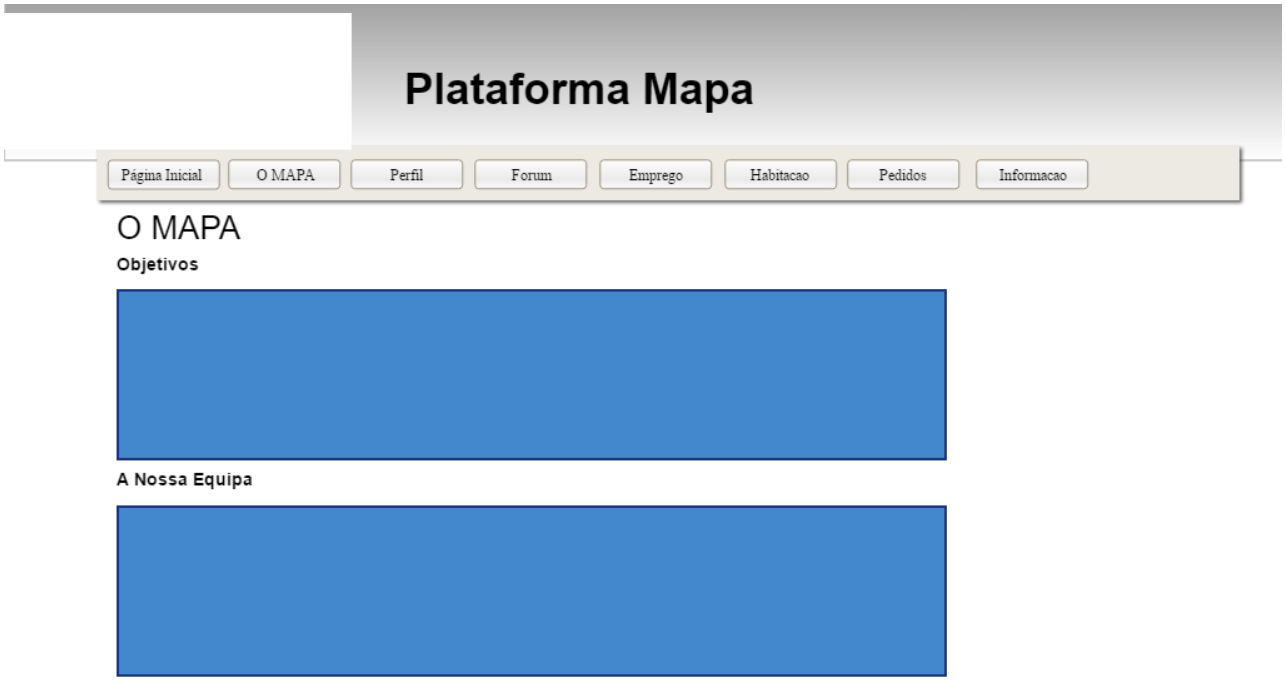


Figura 36 - Protótipo da página "O MAPA"

Diagrama de Entidade-Relação Físico (Base de Dados)